THE HAWAIIAN PLANTERS' MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

Vol. XXI.] HONOLULU, AUGUST 15, 1902. [No. 8

J. F. HACKFELD.

President of the Hawaiian Sugar Planters' Association.

1897.

NEW YORK SUGAR MARKET.—Regarding raws, Willett & Gray state: Owing to an increased demand for refined, the raw sugar market finally turned during the week under review in favor of sellers and a very large business was done in centrifugals, mainly at 3⅜c. for 96° test. These transactions decided the market to have an upward instead of a downward trend and now sellers are confidently looking for some further advance in prices in the not distant future. Sugars are certainly on a low level, and some things are occurring which may help to place them on a rather higher basis.

The total receipts at the Cuban shipping ports were 5,000 tons, exports 11,000 tons. The crop estimates now reach 800,000 tons. There are only two estates grinding. The total stocks left are 382,000 tons, against 121,000 tons last year. Of the 382,000 tons, fully 152,000 tons will be shipped during this and next month, so that by the first of September there will be little more than 200,000 tons left and probably not over 100,000 tons will be offered for sale to the United States for the balance of the year.

The coming crop in Cuba may be much less than the present one, unless more attention is given to the cane fields, but much, also, depends on the weather which so far is favorable. The cane fields are receiving very little attention, owing to planters' lack of money.—Czarnekow, July 24.

The University of California has just issued a pamphlet on Citrus Fruit Culture, covering 46 pages, giving the names of the best varieties of oranges, the best mode of cultivation, pruning, irrigation, and pointing out the diseases that the trees are liable to, with the best tested remedies for such, etc., etc. It is an up-to-date reference book, and should be in the hands of every one interested in the culture of oranges or lemons. It can be had by application to the Ag. Ex. Station, College of Agriculture, University of California. In a future number we shall make some extracts from it.

INDUSTRIAL EDUCATION.—The way that the average American catches on to educational ideas, and especially such as promise lucrative returns, is very interesting, if not amusing. We now find that the University of Illinois has established a course in stock judging. This course has been established only three years and there are now more than 300 students taking it. It is very popular, because it leads directly to employment at much more than average salaries, some of the graduates, after taking a course of but nine months' duration, securing places as cattle buyers at the stock yards and elsewhere at salaries ranging from $2,000 to $3,000 per year. It is just such work as this that is being done all along the line by our many excellent industrial colleges. The promising stud-

ents in all these schools can readily secure lucrative employment the moment they graduate.—La. Planter.

Life in the tropics is often rendered irksome, irritating and prostrating by undertaking to do as much and more laborious work than is expected of a person in cooler climates, where bracing air and encouraging surroundings impart strength for daily active service. Yet, under favorable conditions a person may labor actively and live as long on Hawaii nei, and be able to perform as continuous service as in any cooler climate. The writer of these lines has spent over fifty years of active service on these islands, enjoying during that period as good and perhaps better health than he could have had on any part of the mainland—never having had serious illness sufficient to interfere with daily work. And there are probably thousands of others to whom the same remark may apply. Here are fine schools, churches and literary institutions, liberally supported, asylums and comfortable homes for aged and infirm Hawaiians. The public buildings are substantial, and the burden of government not onerous on any inhabitant.

While sugar is unquestionably the great source of wealth, its benefits are distributed among all classes. No one, native or foreign need be in want, if he makes good use of the privileges offered him. On this and other islands of the group, nature has stored an inexhaustible supply of water to meet the daily wants of the population. Some may be more favored with abundant rains, and on this account be better fitted for many purposes, but all possess advantages for industrial pursuits. There is room for a larger industrial population, and this will no doubt be attracted as the years roll by. For those who have spent their lives where mother earth dispenses her bounties sparingly, or where the enjoyment of the most perfect day may be suddenly followed by chilling blasts from the north, Hawaii offers a climate of perpetual summer, and a field for raising tropical fruits that are always sought here and abroad. In Europe and perhaps America also, the demand for such fruits is changable, but still increasing, and there is always a fair demand. For instance, take bananas and oranges, for which there is always ready sale, there is now an extraordinary demand in Europe and a large order is being filled by Jamaica as is shown in the following extract:

"The Jamaica Gleaner states that the exports of bananas from Jamaica alone for the current year will amount to a total of over ten millions of bunches—the greatest export on record. The returns are compiled according to the computation of the companies, so that two small bunches are counted as one bunch. The total number of actual bunches therefore greatly exceeds ten millions. The prospects for the crop of bananas are excellent, and during the financial year, ending March, 1903, this year's total will probably be largely exceeded. A

well-known official, who is concerned in the compilation of the statistics, has stated that he expected the total at the end of next March would be over twelve millions of bunches."

Our readers will see from this extract what an enormous trade has been created in this fruit to supply the English and European demand. The vessels engaged in the trade are said to be built for and owned by the banana companies, which enables the traders to deliver the fruit at cost prices, and whenever wanted.

In this connection the following from the American Grocer of New York is interesting: "Replying to an inquiry as to when the first bananas came to New York, we would say it was in the year 1804, when a small consignment of thirty bunches came to this city in the schooner "Reynard" (Capt. John N. Chester, of Brooklyn, N. Y.). On the voyage to this city the captain fell in with three French frigates in company, on one of which was Jerome Bonaparte, then on his way to Baltimore to marry Miss Patterson, who subsequently became his wife. On learning the object of his visit to this country, Capt. Chester presented Bonaparte with a bunch of bananas and some plantains, which were thankfully received by that distinguished personage. The balance of the fruit, on its arrival there, was purchased by one Anthony Crappan, a fruit dealer in the old Fish Market, then at the foot of Maiden lane. From that time until 1830 small consignments of bananas were received from Cuba, when a schooner was chartered by John T. Pearsall to transport to New York the first cargo of bananas ever imported under the deck of a vessel from Cuba. The cargo consisted of 1,500 bunches of red bananas and 20,000 cocoanuts, which fairly glutted the New York market. From this small beginning the banana industry has grown to such proportions that it is not unusual for two or three cargoes of 20,000 bunches each of bananas to be disposed of there at the present time in a single day.

———:o:———

THE SUGAR INDUSTRY OF PORTO RICO.

By R. A. Macfie.

In view of so many advantages, it may be asked why the sugar industry of the Island is not now more prosperous and more highly developed than is the case.

The reply to this question is that it is attributable to want of modern methods and appliances, and lack of capital to purchase up-to-date machinery and fertilizers, and all that goes to make a first class establishment.

HINTS TO PLANTERS AND MILL MEN.

Starved lands can no more produce heavy crops than a starved horse can bear heavy loads.

A three roller mill that will break under a pressure of 250 tons cannot extract the amount of juice that a nine roller mill constructed to withstand a pressure of 500 tons will obtain if properly handled.

Although there are some modern mills doing good work in Porto Rico, the generality of the older ones are not capable of extracting more than 60% of juice on the weight of cane, and many not even that.

In more advanced countries, by the use of nine roller mills, from 80 to 84% of juice is obtained, without any increase of operating expenses, and 70 to 78% by six roller mills and maceration.

Juice that is cooked in cauldrons over fires, or exposed for hours to high temperatures, in antiquated clarifying and evaporating appliances, yields neither the same quantity, nor the same quality of sugar that the same juice would do if treated by the Deming system of clarification and concentrated in Lillie Evaporators, whereby the duration of these operations is reduced from hours to minutes.

Fuel economy also has to be looked to, and such appliances, boilers, and furnaces adopted, as have by their use in other countries dispensed with the use of any other fuel besides the bagasse or refuse of the cane, even while admitting of liberal use of "maceration water" to increase the juice extraction at the mills. There is further unsurpassed abundant water power on the Island which might advantageously be utilized as a motive power.

The sum of all these points of inferiority amounts to this:—That the average Porto Rican planter only gets from 6% to 7% of sugar from his cane, and 1½ to 3 tons of sugar per acre, while advanced producers on the Hawaiian Islands are getting 12% to 15% from the cane, and 6 to 12 tons of sugar per acre.

Let it not be thought that these comparisons reflect any discredit on the Porto Rican planter, by no means. Porto Rico till a few months ago was struggling without any protection in almost hopeless competition with European beet-root sugar, which, by the aid of bounties from the treasuries of French, German and other governments, is sold below the cost of production.

That the sugar industry has survived such competition here better than in any of the other West Indian Islands, as has been the case, proves both the natural advantages that exist, and the energy and skill of the planters who, with poor appliances, have been able to maintain so unequal a contest.

Happily a new era has been entered upon and capital judiciously invested in land and up-to-date machinery for the production of sugar may be depended on to give a good return.—Porto Rico Ag.

WATER-HOLDING POWER AND IRRIGATION OF HAWAIIAN SOILS.

THE APPLICATION OF NITRATE OF SODA.

THE ACCUMULATION OF SALT IN HAWAIIAN SOILS.

By J. T. Crawley.

In this and the following articles I wish to record some interesting results of experiments recently conducted for several plantations. The experiments were conducted primarily with a view to obtaining definite results on the action of certain fertilizers in the soil, but they have yielded facts on other questions no less important.

How much of the water applied to it in irrigation does the soil take up and how much goes to waste? This is one of the most important questions to the irrigated plantations; millions of dollars have been invested in pumps, and more millions of dollars are spent from year to year in maintaining these pumping outfits, and for the fuel consumed. In fact the water is the most vital question that the manager of an irrigated plantation has to deal with. It is a well-known fact that different kinds of soils will hold different amounts of water. There is a point of saturation for each soil, beyond which it refuses to absorb water further. All of the excess applied beyond this will either run off the surface or run through the soil. Almost all Hawaiian soils have good drainage, the sub-soil is porous and it is an easy matter for the excess of water to pass downwards. In many of the older countries there is a hard pan of clay or lime in the sub-soil which prevents drainage and such soils will retain all the water in the surface soil, and become water-logged, but Hawaiian soils have very little pure clay sub-soil, and a real hard pan is rarely met with.

In the report of the Hawaiian Experiment Station for 1896, Dr. Maxwell gives the water-holding power of many Hawaiian soils ranging from 31.8% to 89.6%. This means that if these soils be perfectly dry they will absorb about 400,680 and 1,694,940 gallons of water respectively to the depth of three feet. These results were obtained by taking a sample of the soil to the laboratory, saturating it and determining the moisture content. But the absorptive power of a soil freely pulverized is very different from that of the same soil in the field. In the field, unless it has been recently plowed it is hard and compact, the pores are small and the soil will take up very much less water. Following are comparative results of soils saturated in laboratory and saturated in the field:

		Saturated after digging up. Per cent Water.	Saturated in the field. Per cent Water.
No. 1.	Soil from Kahuku	31.95	25.8
No. 2.	Soil from Kahuku	35.89	28.0
No. 3.	Red soil from Honolulu Plantation	33.20	28.21
No. 4.	Soil from the Hawaiian Exp. Station	35.1	24.54
No. 5.	Red soil from McBryde Plantation	39.9	29.61
No. 6.	Yellow soil from McBryde Plantation ...	34.35	27.09
No. 7.	Soil from grass lawn ..	33.36	22.87

Many other like results were obtained but these will suffice to show that in order to obtain the amount of water that any given soil will take up it must be saturated *in the field*, and that the results as given by the Experiment Station cannot be used as a basis for any discussion of irrigation on the plantations. Again, a freshly plowed field, as all irrigators know, will absorb more water than one upon which cane is growing, and a field upon which plant cane is growing will absorb more water than the same field upon which rattoon cane is growing, since the latter has become hard and compact.

The following method was adopted for the purpose of determining the amount of water that the soil is taking up during an irrigation, and how much is going to waste: From the field being irrigated a sample of soil was taken just in front of the irrigator and the moisture found by laboratory test. Four or five hours after the irrigation a sample was taken from the same spot, by which time all the water that the soil had not absorbed had passed off. A moisture test of this was taken and the difference between the moisture content before and after irrigation is the amount that the soil has taken up. Now taking 3,888,000 pounds as the weight of an acre of soil to the depth of one foot—which is very close to the correct figure—we find that each per cent of moisture absorbed represents 9,120 gallons of water that the first two feet of soil has absorbed.

The following table is made up from examples taken from a number of fields from several plantations.

TABLE SHOWING THE AMOUNT OF WATER ABSORBED BY THE FIRST TWO FEET OF SOIL DURING IRRIGATION.

	Per cent of moisture before irrigation.	Per cent of moisture after irrigation.	absorbed. Gallons water
No. 1. Red soil	23.5	25.8	20,976
No. 2. Dark soil ...	27.7	30.36	24,259
No. 3. Dark soil ...	23.8	28.8	45,600

	Per cent of moisture before irrigation.	Per cent of moisture after irrigation.	Gallons water absorbed.
No. 4. 9 months old plant cane .	19.3	25.4	55,632
No. 5. Red soil	18.4	28.6	93,240
No. 6. Red soil	23.3	32.3	91,200
No. 7. Red soil	20.0	28.4	76,608
No. 8. Red soil	27.3	28.21	8,299
No. 9. Red soil	26.12	29.61	31,828
No. 10. Red soil ...	32.2	38.1	53,808
No. 11. Yellow soil .	27.09	27.92	7,539
No. 12. Red soil ...	21.2	32.2	100,320

An average irrigation is probably in the neighborhood of 100,000 gallons, and from the foregoing figures it is seen that a great deal of this is going through the soil, and that as a rule a great deal more water is applied than the soil can possibly take up.

An absolute proof of the foregoing propositions is furnished by the tests of the amount of salt in the soil of those plantations using water that is at all brackish. This was suggested by Mr. Charles F. Eckart in the report of the committee on fertilization to the Hawaiian Sugar Planter's Association for 1901. If all the salt in irrigation water, containing say 50 grains per gallon, were to remain in the surface soil it would accumulate to such an extent during two or three years as to ruin the soil for sugar growing. But the salt is not accumulating to any great extent, as I shall show in report of the salt content, it follows that it is being washed out. But to be washed out there must be an excess of water used, as the salt cannot otherwise disappear.

A Proposed Method for the Control of Irrigation.—The following method, simple and inexpensive, is suggested for the control of irrigation with the belief that it would prove of great value to the plantations. Have samples of soils of different fields taken about five hours after irrigation to determine the absorptive power of the soil. Before irrigation take like samples and the difference in moisture multiplied by 9,120 will give the number of gallons of water that the soil will take up for the first two feet, and let the irrigator be governed accordingly. Not that he can measure the exact number of gallons required, but it will show him whether a small or heavy irrigation is required. It is manifestly wrong to give a field that can only absorb 30,000 gallons as much as another that can absorb 100,000. A salt estimation occasionally will show when a large irrigation is required to wash out the salt. These estimations are very simple and can be made rapidly, and it would seem that the immense expense of the water would justify the trouble.

It has been said by scientific men that when a soil contains 50% of the total moisture that it can hold that it is then in the best condition for plant growth; but I do not believe this to be true with regard to sugar cane. This plant requires a great deal of water, and my observations have shown me that it grows best in a soil that is at or near the saturation point. This explains the practice of plantation managers irrigating many fields that are almost saturated, as can be seen by reference to the above table. But a very small irrigation under these circumstances will do as much good as a large one, and this indicates that frequent small irrigations offer the best conditions for sugar growing.

THE APPLICATION OF NITRATE OF SODA.

A very large amount of nitrate of soda is used, especially on the irrigated plantations, and with results of a very great increase in the yield of sugar. The use of this article is increasing and it becomes very desirable to consider the best method of application.

Attention has been called so many times to the danger of loss of this fertilizer when its application is followed either by a large rainfall or a heavy irrigation, that it should be well understood by everyone. I have recently made some very careful tests to find the amount of nitrate remaining in the surface soil after an irrigation and these tests amply confirm everything that has been written. It is very soluble in water and, unlike potash, ammonia and phosphoric acid, it is not fixed by soil. It goes wherever the water goes and I have found it far below the surface the day after applying it. This makes the question of irrigation and application of nitrate dependent upon each other, and emphasizes the importance of knowing how much of the irrigation water the soil is absorbing. In the case where the nitrate is found far below the surface on the day following its application, the soil was practically saturated before irrigation. In ordinary cases the soil is far from being saturated and will hold proportionally more of the nitrate. During very dry weather when the soil becomes comparatively dry before irrigation the danger from loss of this substance is probably not very great, as it absorbs a large amount of the water, but it must be remembered that enough water is put on the fields to prevent the accumulation of salt, and nitrate is quite as easily washed out of the soil as is the salt.

Three hundred pounds nitrate of soda per acre was applied to a field, samples of soil to the depth of two feet having been taken prior to irrigation and application of nitrate in order to correct for the amount of nitrates already present in the soil. The plat experimented upon was divided into two parts, to one of which the nitrate was applied *prior* to irrigation and to the other *after* irrigation. Seventeen hours after irrigation

new samples of the soil were taken and the nitrates determined. The following results were obtained:

Nitrate in the original soil	.000375%
(1) nitrate applied *before* irrigation, sample taken to the depth of six inches	.0075 %
(2) nitrate applied *after* irrigation, sample taken to the depth of six inches	.0937 %

When nitrate was applied after irrigation there were twelve times as much nitrate in the first six inches of soil than when applied before the irrigation. In the above case a considerable quantity of nitrate of soda was lost through irrigation after putting on the nitrate, but practically all remained in the first six inches of soil, when it was applied after irrigation.

It cannot be question but that nitrate of soda is a very valuable fertilizer, and it is growing in favor, but it is expensive and every precaution should be taken to retain it near the roots of the plants, and with this end in view, it is suggested that it be applied after irrigation, and not before, as is the present practice. The plant will thus have a longer time to make use of it before the water washes it away from the roots.

THE ACCUMULATION OF SALT IN HAWAIIAN SOILS.

Fear has been expressed by many that the continual pumping of brackish water on the cane fields would result in such an accumulation of salt in the soil as to render it unfit for the growing of sugar. Such would be the case were all the salt to remain in the surface soil. For instance the danger point for salt in sugar soils is probably about .2% salt, or say 15,200 pounds salt per acre to the depth of two feet. Now water containing 55 to 60 grains salt per gallon, which is considered quite safe for irrigation purposes, would add to the soil in the neighborhood of 40,000 pounds of salt in one year, or far more than is necessary to ruin the land. Taking the number of years that some of the plantations have been in operation and we see what an enormous amount of salt would have been added to the soil by the present time. In almost all cases where samples were taken for the moisture tests for determining the absorptive power of the soils a test of the salt was made in the same sample. In all of these cases I have found but one case where there was any harmful accumulation. Below are detailed some of these results:

A.	Salt in water of irrigation	.12	per cent.
	Salt in the soil water	.25	" "
B.	Salt in water of irrigation	.2	" "
	Salt in the soil water	.2	" "
C.	Salt in water of irrigation	.012	" "
	Salt in the soil water	.033	" "

These examples might be multiplied, but the above will show that there is being very little accumulation of salt in Hawaiian irrigated soils, and that the danger from this source is very

small. The salt must therefore be washed constantly into the sub-soil. The heavy rains in the winter tend to flush the soils and wash out the salt, but as long as an excess of water is used in irrigation, which is the rule almost without exception, the soils will remain comparatively free of this substance. Whenever it is feared that salt is accumulating, a few heavy irrigations will remedy the evil, provided that the water itself be comparatively sweet. In fact I am persuaded that the only thing that saves many of our soils is the excessive irrigation, and strange to say land irrigated with brackish water needs more frequent and heavier irrigations than where fresh water is used. The reasons for this is that the heavy irrigations wash out the salt, and frequent irrigations prevent the salt water in the soil from concentrating through evaporation to any harmful extent.

This emphasizes the point already made that the irrigations, generally speaking, are too heavy, for, as a rule, as much water is used on plantations having perfectly sweet water as on plantations using slightly brackish water. In the latter case an occasianal heavy washing will do the soil good, but in the former case there can nothing be said in its favor.

———:o:———

ORANGE CULTURE, PICKING AND PACKING IN JAMAICA.

In approaching the subject of orange culture, picking and packing for shipment, it is with no desire on my part to pose as an authority on the question, or to pit my opinion against those of the experienced planter to whom a knowledge of fruit growing and handling rightly belongs, but, having lived for many years in one of the finest fruit-producing parishes in the Island, and being impressed with the importance of the industry, and the necessity for its development being placed on a sound and permanent basis, I have been led for some time past to take a personal interest in the matter, and to do what little I can to secure this much-to-be-desired end. For while we may all be agreed that sugar must ever remain the staple product of the colony, and that in its revival, by means of reasonable preferential concessions on the part of the Imperial Government, and the establishment of Central Factories, lies the only hope for Jamaica's future prosperity, we must not lose sight of the fact that hundreds of our people depend on the frequent visits of the fruit steamers to our shores, whereby to realize a little ready money to meet their most pressing needs and the call of the tax collector.

Hitherto, our fruit shipping experiences have been confined chiefly to the comparatively near markets of the United States and Canada. The short sea voyage and the expeditious transit of our oranges to these countries have in some measure obviated the necessity for very special care in handling and packing,

although we have seen, more than once, hundreds of barrels of Jamaica oranges in an unsaleable condition on the wharves of New York through careless packing, while everywhere we heard grocers complaining that, even if our fruit arrived sound, the unattractive appearance of our packages and the slovenly method of putting up the fruit, adopted by us, precluded the possibility of our oranges ever taking rank with the Florida and Californian products until we were persuaded to bestow more time and care in preparing them for the market.

THE PROBLEM.—But now, gentlemen, we are face to face with the problem of how to pick and pack our oranges so as to carry successfully more than three times the distance to the States and a voyage of twelve to fourteen days instead of four or five; for the markets of the Mother Country are now open to us by the inauguration of the Direct Line of specially fitted steamers, affording facilities for shipping fruit to England never offered to us before, while we have practically the field to ourselves until much later. Could we but place our fruit in good condition at Covent Garden now, high prices could be assured, for our Jamaica oranges for quality have no peer, and the fault is our own that their reputation in England is not better than it is. In confirmation of this statement permit me to quote from a letter received by last mail from a large fruit-dealer in Liverpool. He writes:—"We have been badly in need of oranges for the last three months, and will be for some time to come. Barrels from Jamaica turn out very wasty, but we may hope for better packages in future. With you, I sincerely trust, the prosperity of Jamaica will, in near future, greatly improve, but I also know this improvement can only be accomplished by diligent and persevering energy on both sides of the Atlantic." The difficulties are many, but they are not insurmountable, and as the Italian, Sicilian and Spanish orange packers contend successfully with a long sea voyage and extremes of temperature, so can we; and it might be well for us to review briefly the methods, adopted by them, which have resulted in bringing vast wealth to Messina and Palermo, while whole cities have sprung up on the East coast of Spain during the past thirty or forty years, as the result of an orange industry conducted on business principles. Under orders from Mr. A. L. Jones, it was my privilege to spend some three weeks in Spain, my instructions being to visit Italy, Sicily, Algiers or wherever else I would be likely to gain information that might be of value to the orange shippers of Jamaica. On reaching Valencia, I learned that the season had practically closed further East, so determined to confine my investigations to the region within a couple of hundred miles of Valencia, where three or four weeks still remained before the crop would be finished. My first visit was to the orange groves, or orchards, of Burianna, accompanied by an interpreter and guide provided by Messrs. Reis Bros., a firm of high standing and doing

a larger business, probably, in oranges than any other house in Spain, and were therefore in a position to afford me special facilities in my hunt for knowledge.

In the Field.—On entering the orange field, I was struck by the amount of labor put into the land; every inch is plowed by a crude, primitive and ancient-looking wooden implement, the share alone being tipped with iron which turns up a very shallow furrow effectively, however, stirring up the soil and keeping down the weeds, although the work could be much more speedily and effectively accomplished by one of our modern American cultivators. Not in every plantation in Jamaica can this suggestion be adopted, as much of our oranges grow in the pimento walks, and pasture lands, and the idea, therefore, would apply to only such fields as are entirely given over to orange culture. One thing, however, applies to orange-growing any and everywhere,—if the planter would improve the character and condition of his trees, and the quality of his fruit—he must at least fork up the soil within a radius of six feet round each tree; a trench 12 inches wide, six inches deep, at a distance varying according to the size of the trees and the reach of the limbs, filled with manure, is a very good half-way measure. I also observed that a circular hole is dug around the roots of each tree, the earth being drawn back some two feet, forming a basin-shaped hollow, exposing the roots some 18 or 20 inches from the trunk. The reason given for this is, first, that insect borers, etc., are more liable to attack the roots near the trunk of the tree, and the exposure of at this point leaves them no shelter, and their operations are more rapidly detected; secondly, it was found in the early experience of Spanish orange growers that a gum disease, in the form of a gummy or resinous deposit, accumulated and formed between the earth and the air on the tree which ultimately caused the bark to rot, with the result that 60 per cent of the trees died in the 4th and 5th year of their growth, while in other cases portions of the trees would wither away. Now, the gum drops down and disappears in the soil, while the farmer can very readily observe any evidence of decay in the roots, so as to remove the affected parts. This clearing of the roots has effectively remedied the evil, and the exposed roots rapidly accommodate themselves to the atmosphere, while the improvement in the health of the trees has been most apparent. Within the last few years it has been found necessary to apply to the roots of every thirty trees some 70 kilos, or about 100 lbs. of artificial manure annually, mostly superphosphates, but very little natural manure being available. This, unfortunately, has been found to cause a deterioration in the flavor of the fruit, an evil that must increase as the time goes on, for another decade at least. The species of trees found there are by no means as large as those of Jamaica, but this may be accounted for, in some measure, by the vigilant pruning and the removal of both

tops and branches which are likely to interfere with the development of the fruit.

PLUCKING.—As to the method of picking the oranges. In no instance are they plucked, but with a short pair of clippers, resembling wire-cutting pliers, they are snipped from the stem, three or four oranges being received by the left hand at a time. Before placing the oranges in the basket the portion of stem remaining on the fruit is cut close; boys with baskets slung from their shoulders being employed to climb for the fruit beyond the reach of the men. The fruit is in no case thrown into heaps as with us, but when twenty or thirty baskets are filled the cart comes along and carries them off to the packing houses; the first layer of baskets being placed in a swinging shelf underneath the cart, the second on the bottom, and the third on a layer of boards forming an upper tier, so that there is little or no pressure put on the oranges up to this stage of handling. I would remark that mules and horses are utilized for reaching portions of the orchard inaccessible to carts. They carry about six or eight baskets on wooden crates slung across the backs of the animals, and on arrival at the packing house the fruit is emptied on the floor to the depth of not more than twelve to eighteen inches; sand and straw being freely distributed to receive them. A typical packing house has a floor space of about 70 by 120 ft., to evade the necessity for shelves in laying out the fruit, the shelf system being deprecated by the packers as causing unnecessary handling of the fruit, and being more inaccessible to the sorter. There are no sizing machines in use, as they save nothing in time and labor, each orange requiring to be individually culled with or without them; but then the Spanish women are experts at this business. The buildings are divided into four distinct departments, viz:—sorting, wrapping, box-making, and packing. The sorting is the most important portion of the work and is generally accomplished by elderly women of long experience. The oranges are sorted, first, that damaged or imperfect fruit, or fruit with a blemish, such as a worm hole, a depression from contact with a branch while growing, or for any other reason that the sorters may consider them as unfit for shipment, may be laid aside. Under this head 20 per cent of the harvest is rejected and finds its way to local markets.

CLASSIFICATION.—Much care and study has been bestowed upon the classification of the oranges; for we find that they are packed into boxes, of some seven different sizes. Blood oranges, for example, are packed into cases of 200 each. Then under the heading of "410," which are the largest oranges, we have four sizes: "Ordinary," "Large," "Extra Large," and "Extra, Extra Large"; these names being printed upon the respective boxes, and indicate a variation of three or four inches in the size of the box. Cases containing 714 are usually of one size only, as also are boxes of 1064, which contain the smallest

oranges of the crop. Each box is divided into three compartments by two partitions, the centre space being shorter than the outer two. It is thought that these boxes would be much too large for our fruit. This may be so, although the reasons given are not very convincing so far. There is a possibility of going too far in the opposite direction, and certainly the boxes that prevail here at present do not permit of as ready access of air through the fruit, seeing that the openings are only at the corners, the sides, top and bottom generally being each of one piece, while the Spanish box is made up of narrow laths forming practically a crate, but experience will shortly demonstrate to us whether ours or the Spanish box will best serve the purpose. In any case the barrel must go. The variety of classes accounts for the large number of baskets required in a well-equipped packing house, as separate baskets are required to receive from the hands of the sorter the particular size of fruit intended for the above grades. It will thus be seen that the basket plays an important part in the orange business, and facilitates the handling of the fruit to such an extent that I cannot understand why it has never been adopted in Jamaica. They are of two sorts—shallow and wide, so that the orange may not have too far to drop during the operations of sorting and wrapping, and deep and narrow, so that they can be easily carried upon the shoulders. I shipped a sample order of 200 in the hope that our planters might see the wisdom of adopting them. They are woven from Esparto grass and with ordinary use will last many seasons. To minimize still further the possibility of the fruit being bruised or injured the packers of Valencia line them throughout with sacking.

Wrapping.—Between the sorters and the packers are the wrappers sitting in groups around heaps of the fruit, each heap of a certain class, and being supplied by the men who take them from the sorters, here again they are subject to further inspection, and blemished fruit which may have escaped the scrutiny of the sorters is thrown aside. I have here some samples of the paper used for wrapping, please observe that each bears the stamp or trade-mark of the packer, a guarantee of the quality of his fruit, and he is proud enough of his brand to stand by the consequence attached to carelessness on the part of his employees. No oranges are shipped from Spain which do not bear on each end of the case a stencilled trade-mark or brand of the packer, also number of oranges contained in the box. The brand also indicates whether the fruit is of good quality, or finest or superior quality. The wrapper has a pile of cut papers in her lap, and dexterously placing an orange at one end rolls it from her, gathering the ends in a tight twist at each side, which holds the paper in place prettily and perfectly. An ordinary hand can do 20 to 25 per minute. The wrapping paper is of a very fine, soft, silky quality, made in

Spain. The cost there for enough to wrap an average of 240 boxes is 80 pesetas, or about £2 7s 6 d according to rate of exchange; stamping, 20 pesetas or 11s, 7d. The wrapped fruit is then carried to that portion of the house where they are packed in their respective boxes according to size and class.

PACKING.—And now as to packing. This is done by girls, two of them putting up a box of 714 in 15 minutes and a box of 420 in 10 minutes. I must confess to being somewhat surprised when the carpenter came along to put on the lids; he first tacked the three laths at one end, then, putting his knee on each lath in turn applied his whole weight so as to press the oranges firmly into the box. When the box of oranges is packed ready for the lid it appears to be much too full, the top layer being nearly half their thickness above the level of the box-edge. I questioned the propriety of applying so much force to bring them down. The explanation given that it did no damage, as it was absolutely necessary that allowance be made for shrinkage, that the fruit received equal pressure all through the box, and that while a bounce to an orange would injure it, no harm came by even, steady pressure, which had the result of simply flattening four surfaces, but was not sufficient to cause contusion of the internal portion of the orange; unless by accident or careless packing one or two should be caught between the lid and the edge of the box. When the carpenter has finished nailing on the cover small boys come along with strips of raw hide and nail them around each end in place of hoops; finally the box is handed over to men who dexterously and firmly bind each round and round with some ten or twelve yards of cord plaited from Esparto grass. The boxes are then carried to the Grao or beach where they are loaded on to surf boats and conveyed to the steamers lying at anchor in the roads some half a mile away. I am in possession of every detail regarding cost of materials, also length and breadth of the various boxes, time required for their construction, etc., which will be supplied on application.

FOR JAMAICA.—The foregoing is a brief synopsis of the methods adopted by packers in the plains of Castellon; but there are other points in connection with the handling of fruit in Spain that must not be lost sight of, and I hear that unless we in Jamaica are prepared to follow in some measure these or similar methods in handling our fruit, we can never hope to make satisfactory shipments of oranges to England. For instance, when the season begins with us, we find scores of irresponsible people—in the country parts, at least—renting sheds and vacant houses, at the same time intimating their intentions of buying oranges from the surrounding districts; the people commence to collect fruit, plucking it roughly from the trees, throwing it into heaps some three or four feet high, until a cart comes along, the sides have been raised by the addition of rough sticks tied together at the corners; into this the

oranges are thrown several feet deep and carted to the aforesaid packing sheds, where inexperienced women are employed wrapping in rough straw paper, and packing the oranges unsorted into barrels or boxes, rejecting only such fruit as gives unmistakeable evidence of being hopelessly damaged; but such packers have no means of learning what treatment the fruit has received, not only in the fields and carts, but by the numerous small settlers who bring in their quota in rough hampers on mule or donkey backs for sale. When they arrive at the wharf the barrels are generally emptied in the shipper's shed and again packed, but very much after the same unsystematic method. This would never be tolerated in such places as Burrianna, for in no instance will the packers accept or purchase fruit which has not been picked by their employees. In the foregoing description I refer chiefly to what I have seen personally on the North side of the Island. I acknowledge that in the neighborhood of Kingston and Port Antonio, planters may have within the last year or two adopted much more improved methods of putting up their fruit; but even they, I feel sure, will be glad to take advantage of the suggestions of the Spanish packer, from knowledge acquired after many years in the trade. In every instance the farmer sells his crop on the tree, either by weight or by sight,—if by sight, all that may be blown down subsequently is included in the contract; if by weight, only fruit picked direct from the tree is counted. In the former case the price paid is less, but the risk of loss lies with the packer, and vice versa. The cost of the fruit in May was from $5 to $7 per thousand, but earlier in the season they could be purchased for $2.50 to $3. An orange is an orange in Spain, and every one counts, not three for one as with us. I consider the fruit grown in the regions round Valencia to be very much inferior in every respect to the Jamaica product. It has a very thick rind, although it is said that this applies only to those of the so-called second flowering. Be this at it may, most of those that I saw were coarse in appearance, the surface being rougher than even our Seville orange, while the sweetness and juciness can in no way compare, the seeds larger, much more core, and that very fibrous. The plains of Castellon have a perfect network of canals, a legacy of the magnificent engineering of the Moors. Connected with every 10 or 20 acres is an ancient water-wheel some 10 to 12 feet in diameter, for raising the water to the level of the land for the purpose of irrigation. The horses or mules that turn the wheel are blind-folded, so that they may be kept in ignorance of the whereabout of the driver boy, and so that he dare not stop in his monotonous round until the work is done for fear of the whip, which may be a mile away.

Irrigation.—In discussing with packers the merits of the fruit of the various districts as to their carrying and keeping qualities, I was informed that excessive irrigation ruined the

carrying qualities of the fruit; that while a limited amount of water increased the rind so making the oranges somewhat together and less likely to be bruised in packing, we find that in the Bibara the best examples of the effect of water on the orange; there are two classes of orchard there, one, the "huerto" or gardens, mostly made up land in terraces, where the water let on moistens the soil, but does not remain in pools for any length of time, quickly disappearing through the very porous condition of the land. The oranges produced thus are of a superior quality, and although the trees are planted some 20 feet apart, they yield a larger crop to the acre than those of the Plana, which are planted a little more than half that distance from each other. These oranges keep and carry well, while in the plains of the same district the "huertas" or fields are of a stiffer soil, the water lies longer and disappears slowly, producing a coarse orange which carries badly. Again, the increasing use of artificial manure is an important factor in the deterioration of the fruit in this direction as well as affecting the flavor, natural fertilizer being very much less so, but for reasons which the foregoing but partially explains, oranges from the high elevation keeps much better than those from the plains. Within the last few years a number of bitter orange trees have been introduced from Seville, as experience has proven that sweet oranges budded on to these possess excellent keeping qualities. This fact argues well for the system now so much in vogue in Jamaica of budding sweet oranges on the shoots of Seville orange stumps or on young Seville seedlings. Oranges grown in districts subject to frequent fogs or mist carry worst of all; and in any case should on no account be picked while wet. In the early part of the season it is recommended that the fruit lie for several days in the shed before wrapping so as to permit of its being somewhat softened, the better to adapt itself to the packing process. As the season advances however, this is unnecessary, and the fruit should be put up within, at most, three days of housing.

But I am convinced, from all I have seen and learned of the fruit trade here, that with a few modifications and adaptations to local conditions, Spanish methods may with equal success be adopted elsewhere. It may be objected that we have a much more difficult problem to solve than the Valencians, as the latter have but to provide for a seven or eight days voyage, as against twelve from Jamaica. This argument, however, is ill-founded, as many of the packers employed in Palermo, Messina, and other parts of Sicily and Southern Italy, hail from Burrianna, where they employ exactly the same methods they have been accustomed to in Spain, with the one exception that the boxes are somewhat smaller, and they have to provide for a voyage of from fourteen to sixteen days in a temperature very often in excess of anything we have to contend with in the West Indies. Such facts should be most encouraging to

us in our prospective orange business with England; and while in the streets of London I observed in several fruiterers' windows, Valencian and Sicilian oranges marked 2s. 6 d. per dozen, alongside of which were Jamaicans at 1s. With improved handling, sorting and packing, I am sanguine enough to expect to see the tables turned within a couple of years, and the Jamaican oranges taking first rank amongst citrus fruits, entirely upon its own merits in the English market.—Journal of the Jamaica Agricultural Society.

———:o:———

JORDAN ALMONDS IN CALIFORNIA.

It has always been held that the famous Jordan almonds of commerce could be produced only in this province (Malaga) and, to a certain extent, in the adjacent provinces of Granada and Almeria. Efforts to grow them in other parts of Spain, as well as in France and Italy, are believed to have invariably failed. Recently, I received a letter from the president of the California Nursery Company, of Niles, Alameda County, Cal., reading, in part:

"We send you today per mail in separate packages samples of almonds. The trees from which these nuts were grown we received from France for the Jordan almond. They were a mixed lot of trees, and only one tree produced such nuts as are mailed you. Will you please advise us if they are Jordan almonds? Samples which we received from New York as the Jordan almond that were imported from Spain were oblong and had no curve, like those we send you."

I showed the samples to three different local experts, and in each instance they were unhesitatingly declared to be Almondra larga, or, in other words, the famous Jordan almonds of commerce, of a fair, medium grade. The taste seemed quite the same, and there was very little difference in the shape.

The surprising feature of this incident lies in the fact that the almonds in question are said to have been grown on a tree imported from France. Is it possible, then, that a tree which would not produce typical Jordan almonds in France would produce them in California?

About 85,000 boxes of these famous almonds are annually exported from Malaga, which is their only market of origin. The report from California and the result of my investigation would seem to indicate, however, that Jordan almonds can now be grown in California. If this be true, the California growers will probably find the matter well worth their attention, as both the demand and the prices for Jordan almonds have steadily increased during recent years. The present price of these almonds, for the popular grade known as "confectioners," is $8.75 per box of 25 pounds f. o. b. Malaga. The price at the same period last year was $7 per box.

London and New York have generally taken virtually the

whole crop of Jordans. At present, the local stock of bona fide Jordans is practically exhausted, and although all the present signs promise a good crop this year, it is much too early to speak with any certainty as to the prospect. Of the crop of 1901, 31,200 boxes were exported direct from Malaga to the United States

BENJ. H. RIDGELY,
Malaga, March 29, 1902. Consul.
—Consular Reports.

———:o:———

GERMAN SUGAR INTERESTS SINCE THE BRUSSELS CONFERENCE.

Although it is now several months since the convention abolishing, after a prescribed date, export premiums on sugar was signed at Brussels by all the leading European nations except Russia, it is not yet possible to estimate, even approximately, its effect upon the area to be planted with beets this spring, or the probable sugar product and consequent market prices of the coming year. For the reason that the convention does not take effect until the 1st of September, 1903, and that meanwhile the different nations must each revise and enaact a whole code of laws and regulations for the control of their sugar industries, there is nothing to indicate that the majority of beet growers—at least in Germany—will modify seriously their plans for this season's planting.

The announcement that the Brussels convention had, after so many previous failures, really agreed upon a plan to abolish export bounties came to the enemies of that measure with the shock of an unexpected surprise. The whole proceeding was recognized as a decisive victory for cane as against beet sugar —a conquest for the Indies, Tawaii, the Philippines, and Louisiana over Continental Europe. The Zucker-Industrie, the leading organ of the German sugar-producing interests, hastened to say that if the convention were carried into effect the result would be a blow to the sugar industry of Germany from which it would never recover. It said: "In the world's markets, our product will be overwhelmed by colonial sugars, which enjoy important and decisive advantages. Germany will be flooded with foreign sugars because our import duty is so small; the cartel will be rendered forever impossible; the price of beets must be reduced by at least 30 pfennigs (7.14 cents) per 100 pounds; beet cultivation, and with it agricultural prosperity, must inevitably decline."

Six days after the signing of the convention at Brussels, a mass meeting of representatives of the beet-growing and sugar-making industries was held in Berlin, at which much impassioned oratory was heard, but the general impression left by the conference was that of a merely general but vaguely defined opposition to any change in the present system, which

in effect taxes sugar consumers in Germany to pay the cost of supplying Great Britain and the United States with German sugar at about half the price which—under the ministrations of the cartel—it costs at home. In the resolution which summarized the action of that meeting, it was stated that it was too early to estimate closely and accurately the full effect of the convention, but that as it had yet to receive the approval of the Reichstag and Bundesrath, as well as the imperial signature, there still remained opportunity for resistance, and to this the meeting pledged its loyal and united efforts.

It is recognized, however, that the agreement signed at Brussels will bring to European statesmen the end of a long financial nightmare; that it will give relief to sugar consumers everywhere and will require the Governments of France, Germany, Austria, Belgium, and Holland to set the beet-sugar industry back upon its own feet, to stand or fall by its own merit and in accordance with the measure of skill and foresight that may be embodied in the new legislation which will replace the present system. This legislation will presumably be shaped to accomplish one or more of three principal results: (1) to sustain sugar production by promoting its consumption at home, (2) by enhancing through commercial treaties sugar exports to countries which—like Great Britain and the United States—are more or less dependent upon imported supplies, and (3) by restricting beet planting and overproduction of sugar.

Germany has heretofore exported, roughly speaking, two-thirds of her sugar product, and the problem presented to the statesmen of this country by the new conditions which are to obtain after the autumn of next year is complicated and serious. Beyond the readily assumed fact that the convention will be loyally carried out, nothing in the way of new legislation has been decided upon or more than vaguely suggested. The promotion of home consumption of domestic sugar through reduced retail prices involves naturally the question of duties on imported supplies. The present duty of 40 marks ($.52) per 100 kilograms (220.46 pounds) is not changed in the new tariff act now under discussion, and it remains to be seen whether that rate will be considered sufficient after bounties have ceased. The necessities of the sugar situation will in all probability exercise a strong influence in respect to the new treaties of commerce which will have to be negotiated under the revised tariff, but beyond these general facts all is as yet mere conjecture. Meetings of co-operative beet growers and sugar companies are held from time to time to discuss plans and policies. There is in their deliberations more or less talk about reducing the area of beet planting, but, so far as the reports show, no definite agreement on this point has been reached. Bounties will be paid as heretofore until the end of August, 1903, and the question of area and production will therefore not reach the acute stage until the spring of next

year. Under the heroic management of the cartel, sugar growing has been for years past the most profitable branch of German agriculture, and the farmers, the raw-sugar makers, and refiners who have thriven under the bounty system will naturally strive to make the most of it as long as it survives.

———:o:———

THE BRUSSELS CONFERENCE AND RUSSIAN SUGAR.

The beet-sugar conference which recently closed its sessions at Brussels arrived at an agreement which, if indorsed by the countries represented at the conference, will abolish all bounties on sugar in 1903. It was also agreed, subject to the same indorsements, that the duty on sugar imported into each of these countries should be fixed at 58 cents per 100 pounds. Should this agreement be ratified—of which there is considerable doubt—the price of sugar would at once rise in the markets of the world, for the reason that the annual production would be largely curtailed. The current production of beet sugar in Europe, according to the latest statistics, amounts to over 6,000,000 tons, which exceeds the consumption by more than 1,000,000 tons. The countries represented at the conference were Germany, Austria-Hungary, France, Belgium, Holland, Sweden, Denmark, and Roumania. When the result of the conference was announced, Roumania withdrew.

Russia was not represented at the conference, but the action of that body was closely watched here, and the results are even now agitating official circles. Russia has the largest area under cultivation in beet root in the world; is third in the number of factories; fourth in the quantity of beet root used and sugar produced; and stands lowest in the yield of roots and of sugar and third in the percentage of sugar to the weight of beet. The action of the conference must naturally have an effect on the sugar industry of Russia, though the official organ of the Government declares that "Russia will not enter into any kind of agreement which in any way attacks her tariff policy and the organization of her industry." Instead of such an agreement, a series of internal measures are recommended which, it is hoped, will render the sugar industry of Russia independent of the world's market.

The export of Russian sugar to western Europe is comparatively small, but its export to Eastern countries is large, and the countries represented at the conference will certainly endeavor to secure a share of this trade. It would not be difficult for Russia to use up its present export of sugar in the home market; the consumption per capita is very small and the cost to the consumer is abnormally high. The Government fixes the price at which sugar may be sold in Russia. According to Russian calculations, the sugar industry loses annually on the exports to western Europe over $3,000,000 or about 15 kopecks (8 cents) on every pood (36.1 pounds) of sugar produced. The

profits on the sales in the home market are so large that this loss is not felt. An order from the Government lowering the price of sugar in the home market would speedily result in such improvement in the cultivation of the beet root and in the method of manufacture as would make the cost of production very much less than at present.

It is also stated in the official organs that the production should be curtailed, as it is abnormal. In view of the small consumption of sugar per capita in Russia, this statement excites surprise. The entire sugar surplus of this country does not exceed 16 to 17 per cent, and, at a lower figure, it would be readily consumed by the population.—Consular Reports.

———:o:———

INCREASING CONSUMPTION OF SUGAR IN THE UNITED STATES.

Some data recently compiled by the United States Treasury Bureau of Statistics bring out vividly the enormous increase in the consumption of sugar in this country. In 1870 the total consumption of sugar in the United States was about 566,000 long tons. In 1901, a lapse of 31 years, the consumption of sugar in the United States reached 2,365,000 long tons, more than four times the consumption of 1878, or 417 per cent. of the consumption of 1870, or an increase in the consumption of sugar of 317 per cent in 31 years.

Of course, a considerable part of this is due to the increase of population in the United States, but apart from that there has been a large increase per capita. In 1870 the consumption of sugar per capita in the United States was 33 pounds; in 1901 it was 68 pounds per capita, an increase of 106 per cent or more than double. There is a belief extant and more or less well founded, that the actual consumption of food articles does not vary much from year to year because of price or from any other common cause. The distribution of food articles varies with prices, but the actual consumer of sugar, tea and coffee, seems to desire and to get about the same daily ration, be the price low or high. If there be an exception to this food article rule, sugar would seem to constitute that exception. The merits of sugar as a food stuff are now far better understood than 30 years ago and the use of sugar foods is everywhere encouraged as healthful and economical.

This may lead us to look ahead and to say that in 1931 our consumption of sugar will be 136 pounds per capita, and that our country will then consume nearly five million long tons of sugar. This ought to give buyers for the cane sugar of the whole Gulf Coast, from Florida to Texas, as well as several millions of tons of beet sugars from the states of the great West and the Pacific.—Ex.

SUGAR INDUSTRY OF THE SOUTH.

By W. C. Stubbs, Director of the Louisiana Sugar Experiment Station.

Any account of the resources of the South and a recital of their development in the last twenty years would be incomplete without an article upon the sugar industry—an industry which, despite the many serious obstacles it has encountered, has expanded until it occupies the larger portion of South Louisiana, a goodly part of East Texas, and constitutes an important item in crop production in all the counties adjacent to the Gulf of Mexico and Atlantic ocean in the States of Mississippi, Alabama, Florida, Georgia and South Carolina.

From De Bore's first crop of $12,000 in Louisiana, the annual output of sugar, syrup and molasses has grown in value far up into the millions. The crop of 1900 in Louisiana alone required $35,000,000 to market it. If to this be added the sugar crop of Texas, now rapidly expanding, and the syrup crop of the small farmers, it would not be far wrong to place a value of at least $50,000,000 upon the sugar-cane industry of the Southern States.

While the increase in value has been enormous, the improvements in methods and machinery have been almost incredible. De Bore's small sugar house, with its horse mill and iron kettle, has been supplanted by the modern central factory, with its ponderous nine-roller mills and crushers or diffusion batteries, with improved superheaters, clarifiers and filter presses, with the multiple vacuum effets, with immense vacuum pans and capacious centrifugals.

Formerly the horses and oxen propelling the mills were sustained by the tops of cane. Today the great boilers which generate the steam that propels the ponderous rollers and evaporates millions of tons of water from the extracted juice are "fueled" mainly with the refuse of the cane (bagasse) which their own force has created.

So complete has been the change that not only De Bore and his colleagues of that early day, but the ante-bellum planters —yea, even those who essayed the re-establishment of the industry after the Civil War—would be strangely out of place in a modern, up-to-date central factory.

The improvements have not been confined to the factory. Agriculture has kept an even pace with manufacture. The primitive plow and home-made drags have been supplanted long since by the improved steel turn-plow and revolving harrow, and these in their turn succeeded in late years by the disc plow, harrow and cultivator. Improved implements have largely displaced hand labor, and the hoe gang, formerly in

evidence in every field, is now being rapidly relegated to the realm of "innocuous desuetude" by the ingenious horse hoes and cultivators found on nearly every plantation. Even a cane-harvester, now being evolved from the brain of genius, is constantly expected and eagerly awaited everywhere as the first valuable contribution of the twentieth century to the sugar industry.

Drainage is now recognized as the pre-requisite of large production, and irrigation is discussed by all and practiced by a few as an essential to uniformly good crops.

The alluvial lands of the sugar country were once deemed of inexhaustible fertility, and an effort to supply artificially fertilizing ingredients thereto would have been regarded as the act of a madman or the dream of a visionary, yet the opening years of the present century find every planter applying enormous quantities of tankage, cotton-seed meal, acid phosphate, etc., to these very soils, and his act is amply justified by the annual increase of crop. Science has demonstrated that properly-selected fertilizers judiciously applied will enhance acre yields even on the richest soils.

A triennial rotation of plant cane, stubble cane and corn and cowpeas has been almost universally established, and so strong is the confidence in the efficacy of this rotation that prices of $2 to $3 per bushel for cowpeas do not deter a single planter from its practice.

This wonderful development has been attained amidst almost insuperable dufficulties. Floods have repeatedly inundated entire sections and destroyed thousands of acres of cane. Pestilence, "that walketh in darkness," has several times smitten the sugar districts. The Civil War completely prostrated the industry, and reconstruction kept it prostrate for many years thereafter. Healthful recuperation became visible only after the overthrow of the carpet-bag government and the re-establishment of law and honesty. Low prices and unreliable labor have sometimes shorn the industry of all of its profits.

Coolie-raised or bounty-fed sugars of other countries have occasionally, by competition in our local markets, lowered the price of sugar below the cost of production. And lastly, perhaps the most formidable obstacle of all, is the want of permanency in our national legislation, a defect inherent in our form of government, which gives the people the opportunity every four years of changing the political policy of the country. The apprehension of reciprocity treaties with foreign countries by which sugar will suffer is today checking seriously, but temporarily, let us hope, that progress of the industry which the capitalist and the planter would otherwise develop.

All of these have militated against the advance of the sugar industry, and yet it has attained such a degree of excellence that Louisiana is now justly esteemed as the leader of the

sugar-cane world, and is sending daily words of intelligence and experience to every tropical sugar country.

This progress, marvelous as it has been in the aggregate, has been achieved through much suffering, large expenditures of money, and unceasing activity of brain and hand, at times advancing with almost imperceptibe gradations, at others with leaps and bounds. It can be proven that nearly every dollar made by the sugar-planters of the South since 1880 has been expended in the improvement of their estates and in the enlargement of their sugar-houses, until today they represent an investment exceeding $100,000,000. Some idea of the progress in the march of improvement in the manufacture of sugar may be obtained when it is asserted that some sugar-houses in this State have been rebuilt three times in the last twenty years, each time with larger and more improved machinery, to meet the increasing crops of the plantation and to decrease the cost of manufacture, for, be it remembered that an increase in the capacity of a sugar factory means a decrease in the cost of manufacture of a pound of sugar.

These are the results in the field and factory, but there are indirect results in the cities to which the sugar is shipped well worthy of mentioning. No agricultural industry contributes so much to the public carriers as sugar. Our railroads transport a large part of the cane from the fields to the factories. The average tonnage in Louisiana is about twenty-two tons. An average car will carry fifteen tons; therefore, each acre furnishes one and one-half carloads of cane, which, at sixty cents per ton, about the average price paid, gives the railroads an income of $13.20 from each acre of cane grown. This is for the transportation of the raw material to the factory. Two tons of cane will give a barrel of sugar, and this must go to the market. Each acre will thus supply about eleven barrels of sugar, upon which freight varying from twenty-five to seventy-five cents per barrel will be collected. It is possible, therefor, for a railroad in a sugar section to realize *at least* $15 in freight for each acre of cane grown along its line.

Compared with cotton, the profits of sugar-growing to a railroad is significantly emphasized. The average yield of cotton in this State does not exceed half a bale per acre. It will therefore require two acres to furnish a bale of cotton and thirty bushels of cottonseed. If both are shipped to market over the railroad, the prevailing prices would not give the latter more than $2 to $2.50 in freight from two acres in cotton.

The sugar industry has created in the cities of the country (mainly New Orleans, the largest American sugar market) various and valuable industries. Factors, brokers and bankers receive and distribute its products and share in the profits. Warehouses obtain storage charges. Foundries and machine shops, employing thousands of skilled mechanics, are engaged in the supply and repair of sugar-house machinery. Cooper-shops

manufacture the barrels and hogsheads used in casing the products. The implement men, the mule dealers, the coal and oil sellers, the fertilizer agents et id omne genus, are all conveniently established to soicit the trade of the planters. In fact, the sugar-panter of today may be regarded simpy as a "money-changer," exchanging every dollar received for labor, material, provisions and clothes. After careful investigation and patient study of the facts as they exist, it may be truly said that of the $35,000,000 annually received for the sugar grown in this State, every dollar is paid out as fast as received, and a portion of it doubtless finds its way to every State in the Union, creating an interstate commerce of nearly $70,000,000 annually.

The following is an approximate distribution:

To Pennsylvania, Tennessee, Alabama, New York and Illinois, $6,000,000 for machinery.

To Mississippi and Louisiana, for brick and lumber, $600,000.

To Kentucky, Tennessee, Missouri, Indiana and Texas, for mules and horses, over $1,000,000.

To Pennsylvania, Alabama, West Virginia and Texas, for coal and oil, $1,500,000.

To Minnesota, Missouri and Kansas, for breadstuffs, $3,000,000.

To Illinois, Missouri, Kansas and Iowa, for stock feed, $3,000,000.

To West Virginia, Ohio, Illinois, Missouri and Kentucky, for wagons, carriages and agricultural implements, $500,000.

To Ohio, Indiana, Illinois, Missouri and Nebraska, for meats and lard, $3,000,000.

To Wisconsin, Illinois and Indiana, for butter and cheese, $500,000.

To Texas, Mississippi and Alabama, for beeves, exclusive of refrigerated beef from the West, $500,000.

To Alabama, for lime for building purposes and for use in factories, $500,000.

To Ohio, Indiana and Illinois, for cooperage, $1,000,000.

To Georgia, South Carolina and Tennessee, for cowpeas, $300,000.

To Florida, South Carolina and Tennessee, Illinois, Missouri, Nebraska and Louisiana, for phosphates, cottonseed meal and tankage, $500,000.

To Boston, St. Louis, New York, Philadelphia, etc., for shoes, $1,500,000.

To New York, Chicago, Philadelphia and Baltimore, for clothes, $5,000,000.

If there be anything left it is spent for notions, fruits and sundries, which are gathered from Maine to California.

It will thus be seen that the development of the sugar industry in Louisiana has benefitted nearly every section of the country.

As before remarked, prior to the year 1880 the sugar crop

was very precarious. Only once (in 1878) did the yield reach above 100,000 tons.

In 1877 there was formed in the city of New Orleans the Sugar-Planters' Association, which at once became a powerful factor in developing the industry. For the first time, in 1880, syrup was sent by the small sugar-houses to the larger factories to be grained into sugar. This was the beginning of the central-factory system in the State. In 1881 the Mississippi river commission was created by Congress, which, in addition to the improvement of the navigation of the Mississippi river, has also aided in the construction and maintenance of the levees, and protected the lands from overflow.

In 1885, through the action of the Sugar Planters' Association, the sugar experiment station was established, which has been of incalculable benefit to the panters of the State by its experiments in the field, laboratory and sugar-house.

Since 1886 the industry has grown in acreage planted, in improvements, in fertilizing and cultivating the cane, as well as in the efficiency and capacity of the sugar-houses.

It is true that the number of sugar-houses is gradually diminishing, but the aggregate capacity is yearly increasing. The following table, taken from Bouchereau's Reports, shows the quantity of sugar raised in Louisiana from 1880 to the present year in tons of 2240 pounds:

	Tons.		Tons.		Tons.
1880.....	121,886	1887.....	157,970	1894.....	317,306
1881.....	71,304	1888.....	144,878	1895.....	237,720
1882.....	136,167	1889.....	128,343	1896.....	282,009
1883.....	128,318	1890.....	215,843	1897.....	310,447
1884.....	94,372	1891.....	160,937	1898.....	245,511
1885.....	127,958	1892.....	201,816	1899.....	147,164
1886.....	80,858	1893.....	265,836	1900.....	*325,000

*Estimated—not from Bouchereau.

The crop just harvested for 1901 can as yet only be estimated. Notwithstanding the scarcity of labor and the early freezes caused a loss of perhaps 10 per cent of the cane grown, it is believed that the crop will be the largest on record, and will probably reach 350,000 long tons.

An examination of the above table will show a steady increase from 1886 up to the present, with fluctuations due to the prevailing seasons. In 1891 a prolonged drouth seriously injured the crop, while severe frosts are accountable for the small yields of 1886 and 1899.

The cane heretofore cultivated throughout the South has been of the purple variety, with its ancestor, the "purple striped." Many varieties have been at various times imported and tried without success.

In recent years the sugar experiment station has imported a

larger number of seedling canes, developed in the tropical islands. Of these seedings, two have proven worthy of extensive trial, and accordingly have been distributed among the planters and farmers of the South. On the sugar experiment station they have done well in the field and sugar-house, and it is confidently expected that they will, when universally planted, largely increase the sugar output of this State. They came from Demerara, and are designated D. 74 and D. 95.

Many obstacles to sugar culture are such as are encountered in the cultivation of any crop. Drouths and excessive rainfalls are injurious to crops everywhere, while severe cold frequently destroys the fruit crop, and sometimes the wheat crop of the North and West. From a climatic standpoint the growing of sugar-cane presents no more obstacles than accompanies the cultivation of other crops. Year in and year out, it is about as certain as our cotton or wheat crops, and no one has yet assigned a failure in either of these crops to their being exotic and unadaptable to our climate.

The most serious obstacle our planters have encountered in the past has been the occasional crevasses and overflows destroying the growing cane. A cane crop once destroyed requires several years for its restoration, and therefore an overflow to a sugar planter is almost fatal. Fortunately, the national government, after years of neglect and indifference, recognized its obligation to the riparian dwellers of the Mississippi in the creation of the Mississippi river commission in 1881, whose duty it is to improve the navigation of the river and works connected therewith. It therefore included the construction and maintenance of levees. This action on the part of the national government was promptly seconded and supplemented in Louisiana by the creation of levee districts, with power to issue bonds, levy and collect specific taxes, and erect and maintain efficient levees. From the issue of bonds and proceeds of levee taxes, supplemented with appropriations from the Mississippi river commission, the levees of the State have been rebuilt, strengthened and raised everywhere three feet above the highest waters known. It is believed that the day of overflow is gone. There is a possibility that caving banks, crayfish holes, etc., may even now occasionally produce a crevasse and temporarily overflow a restricted area of land, but a general overflow caused by extreme high water is now believed impossible. There are in the State about a dozen levee districts, each controlled by a separate board, the members of which are appointed by the governor of the State. These boards, with the assistance of the State engineers, build and maintain the levees of the State, utilizing the funds derived from taxes self-imposed by the dwellers in each district upon his own lands and products. They have succeeded, with the help of the national government, in erecting powerful levees everywhere at a cost high up in the millions, and have main-

tained them for years during flood periods. Such confidence is shown in these levees that the dwellers behind them feel as secure in flood seasons as those who occupy the bluff and hill lands of the State. The confidence of the financial world in them is exhibited in the high values of the bonds of the various levee boards, all of them being well above par.

The greatest obstacle to the development of the sugar industry of Louisiana is now happily reduced to a minimum, if not entirely removed.

Sugar has been an ideal producer of tariff ever since the national government was founded, save from 1890 to 1893, when a bounty was given to the local producers.

A duty of one cent per pound on brown and three cents on refined sugar was imposed in 1789. These amounts were soon increased to two and one-half and four cents per pound. In the war of 1812 it was raised to five cents per pound, but lowered again in 1816. These duties were imposed strictly for "revenue only," since no sugar was then made in the United States, and were continued up to 1832, when the "compromise act" was adopted, which operated till 1842, when brown sugar was again taxed two and one-half cents per pound. In 1846 a 30 per cent. ad valorem tax was established, which remained until 1857, when it was lowered to 24 per cent, ad valorem, and so remained until the Civil War. During the war it fluctuated from three-quarters of a cent to three cents per pound, the latter figure prevailing until 1869, when it was reduced to two cents. In 1873 it was raised to two and one-half cents per pound, and remained at this figure until 1890, when the bounty of one and three-quarters and two cents per pound was given the local producers in lieu of tariff. Under the Wilson bill the bounty was abolished, and an ad valorem of 40 per cent, with differentials of one-eighth and one-tenth of a cent a pound, was levied. This continued until after the inauguration of Mr. McKinley as President, when the Dingley bill was passed, giving from one and one-half to 1.95 cents per pound on sugar, according to purity.

From 1890 to 1893 is the only period in the history of the United States that brown sugar was admitted free. At all other times it has averaged two cents per pound.

It is, therefore, with feelings akin to horror, and a righteous indignation almost irrepressible, that the sugar planters of the State look upon the proposed reciprocity with Cuba, by which a portion, if not all, of the duty now imposed on foreign sugars will be remitted. The time, too, is inopportune, since the enormous beet crop of Europe has forced down the price of sugar in the world's markets to a point believed to be everywhere below the cost of production.

THE SYRUP INDUSTRY.

Besides the sugar industry of Louisiana and Texas, there is,

in the aggregate, an enormous syrup industry scattered throughout all of the South Atlantic and Gulf States. Sugar-cane is grown by the small farmers in patches from a fraction of an acre up to even 150 acres. This cane is grown and manufactured in the most primitive manner. Small horse mills, extracting not more than 50 per cent of juice on the weight of the cane, are in use on every farm. Kettles and shallow pans heated over open fires are used for the concentration of juice to syrup. No re-agent save heat is used in clarification, and the loss in scums, which are usually thrown away, is enormous. These patches of cane may be seen by the traveler on the railroads almost continuously from Charleston, S. C., to New Orleans, La. The cane is grown upon the light, sandy pine lands of the tertiary and coastal plain belts. By proper fertilization excellent crops are produced. The cane grown upon such lands is much richer in sugar than that grown in the alluvial section, and to a central factory making sugar would be worth more per ton. Even by such wasteful methods the aggregate of syrup made is enormous, and, after supplying the home demand, is sent in large quantities to the North and West, where it fetches highly remunerative prices. There have recently been established at various points in Alabama, Georgia and Florida syrup factories, where large areas of cane are annually manipulated into syrup. The syrup industry has received within the last two years a powerful stimulus through the energetic efforts of Capt. D. G. Purse, president of the Board of Trade, Savannah, Ga. He has thoroughly studied the sugar industry of Georgia, Florida and South Carolina, and has called the attention of capitalists to this inviting field for investment in central factories. He has held public meetings all through this section, and addressed the farmers upon the necessity of more advanced methods in cane culture and more economical and intelligent process of manufacture. He has had the writer, of Louisiana, and Dr. Wiley of Washington to visit this cane section, analyze the canes, and make public report of the work. Dr. Wiley has also investigated the soils of this section, and his results, together with analyses of a large number of canes, will soon be published in a special bulletin from the Department of Agriculture at Washington. Captain Purse is now laboring with the Georgia legislature for the establishment of a sugar experiment station somewhere in South Georgia. The area devoted to cane is constantly increasing, and the methods of manufacture gradually improving, and a recent personal inspection of this section gives assurance that when the intelligent and progressive practices of the best sugar-producing countries are universally adopted, sugar and syrup can be grown successfully in competition with the world. The saccharine richness of the cane and the abundance of cheap labor are favorable factors in preparing a solution of the above problem. Another significant fact upon which to base a con-

vincing argument in favor of central factories is found in the ever-widening area devoted to cane, and the presumably profitable returns obtained for syrup made by crude and wasteful methods.

It is almost certain, if no unfriendly legislation occurs in the near future, that this syrup industry will continue to expand until it shall have assumed proportions but little inferior in value to the sugar industry of Louisiana and Texas.

Allusion has been made to the greatly increased yields in both field and factory.

In our field may be found evidence of progress. Thousands of tons of fertilizers are annually consumed. Large turn and disc plows invert the soil with its cover of cowpeas. Improved disc and middle cultivators are used by nearly every planter. Stubble shavers and diggers have supplanted hoe labor in the stubble or rattoon crops of cane. Fertilizer distributers deposit the fertilizers upon both sides of the row at once. Improved listers or double-mold-board plows aid in reducing the cost of bedding land. Heavy double rollers compress the dirt on planted canes. Harrows of every kind are found in our fields. The cane cutter or harvester has not yet materialized, although a standing prize of $2,500 by the Sugar Planters' Association awaits the successful inventor.

Our factories are as near perfect as human ingenuity can construct. Immense crushers or shredders prepare the canes for ponderous six and nine-roller mills. Various and ingenious devices are used for transferring cane from carts to cars and from cars to the carriers, thus reducing the cost of handling cane enormously.

Filter presses of various patents filter the scums and juices in every sugar-house.

Superheaters are almost universally used. Crystallization in movement is practiced upon many plantations.

Improved sulphur machines furnish the sulphur dioxide to bleach the juices, which are concentrated to syrup and cooked to grain in vacuum by the exhaust steam of the engines and pumps. Many of our sugar-houses have a capacity of working up 1,000 to 2,500 tons of cane per day, and making out of it 500 to 1,250 barrels of sugar.

Taking a retrospective view of the sugar-cane industry of the South for the last twenty years, it can truly be said that there is no industry in the world that has made such progress. The organization of the Sugar Planters' Association in 1877 may be regarded as the starting point of the renaissance of the sugar industry. Since that time the sugar experiment station has been established, whose teachings and experiments have illuminated the field and factory. "The Louisiana Planter and Sugar Manufacturer" has had its birth in this period, and is now firmly established, visiting weekly the home of every planter, manager, overseer, sugarmaker, etc., carrying with it

information upon every subject pertaining to the agriculture of sugar-cane and the chemistry and manufacture of sugar. The Sugar Exchange has been created in New Orleans, where the products of the plantation are quickly sold. Improved implements for the preparation and cultivation of the soil everywhere prevail. Improvement of soils, both by scientific rotation of crops, involving the nitrogen-gathering cowpea, and the extensive use of commercial fertilizers, whose purity and guarantee are sustained by chemical analyses made by official chemists without cost, are everywhere in evidence. Tonnage in the field and yield per ton in the sugar-house has largely increased, and the cost of growing the cane and of manufacturing it into sugar materially reduced.

Small sugar-houses are fast disappearing—yea, almost obliterated—and enormous factories with every modern labor and fuel saving apparatus are to be found in every section. Many factories have already introduced petroleum oil from Beaumont as fuel in place of coal, and all will follow the ensuing season. The output of sugar per acre and per ton has been greatly increased. New lands are being opened and old plantations better drained and cultivated.

In fact, "expansion" in the cultivation of sugar-cane in the South and of the sugar-beet in the West, and sugar factories in the "expansion," is the only kind favored by the sugar planters of the South. Thousands of acres of land well adapted to the growth of sugar-cane are available in Louisiana, Texas and other Southern States. Capital alone is wanted to develop them and build the necessary factories, and this will come if our national legislature will give us permanent tariff laws protecting sugar.

WM. C. STUBBS.

———:o:———

PLANT TREES.—A tourist told of a tree said to be about three hundred years old, standing in one of the historic cities of Bengal, for which the present owner refused $2,000. The tree is a choice species of mahogany, every inch of the wood of which is of value. The man who planted it probably never dreamed of the enrichment he was providing for a far-down-the-line descendant. Plant trees, and as valuable trees as you can find.—Ex.

———:o:———

Many people hold erroneous ideas as to the value of soil analyses, some speaking as though they only required to have the soid analysed to know what manures to apply to certain crops to obtain the best returns. This, however, is far from being so. In the first case, it would be nearly impossible to obtain a sample that would fairly represent even a ten-acre field. Besides this, an analysis will only show what the soil contains; it will not tell whether the plant food is in such a condition that the plants can make use of it, neither will it

tell him what treatment the soil requires to make that plant food available. So many other things, such as the physical condition of the soil and subsoil, its ability to retain moisture or perhaps the reverse, have to be taken into consideration that (except to the scientist) a soil analysis is just as likely as not to prove misleading in dealing with the manures such a soil requires. The only guide is experience. Find out what others have done under similar conditions, and prove by experiment whether the treatment beneficial in their case is equally so in yours.—Ex.

———:o:———

The cork forests of Spain cover about 650,000 acres of land. Gerona is the chief cork province. Catalona produces the best bark, compact and firm; while Andalusia trees grow much quicker, but the bark is inferior. Cork trees shed their bark periodically if left to themselves, but the bark is much better if removed by hand, and this can be done without injuring the trees. Trees are not, or should not, be stripped until twenty-five or thirty years old, and the peeling then goes on every eight or ten years. The trees live to be 150 years old or more. Spain exports over 1,000,000,000 corks and over 1,000 tons of corkwood in bales, each weighing 160 pounds.

———:o:———

BY AND BY.

This old world is what we make it—
You and I;
'Taint the world's fault if things often
Go awry.
If we want it better
We must try
To dispel the clouds of doubt,
Put the pessimists to rout;
Then our hopes will come about,
By and by. —Anon.

———:o:———

CRUDE OIL FOR FUEL.

A correspondent of the Louisiana Sugar Planter has the following relative to crude oil as fuel:

A few remarks on the general details of the problem may interest some and be of use to others, especially those who have not yet made the change, but are expecting to do so for the coming campaign. To begin with, it may be said that the oil is atomized into a fine spray (the finer the better) because the oil cannot be successfully and perfectly burned on a large scale in any other manner, and that steam is the vehicle used for this principally because it is by far the cheapest method and accomplishes the work when properly handled, in a manner which appears to admit of little improvement. All

of the oil burners on the market, and their name is "oceans," are designed with a view toward securing the best or finest atomization of the oil possible, so that each atom will receive its proper quota of oxygen while in suspension, and this is secured in substantially the same manner in all forms of burners. These burners, however, have a widely varying steam consumption for a given degree of atomization.

The best results are obtained from those in which the oil tube is surrounded for the greatest length, by the steam which is used by it, and in which the oil and steam travel farthest together, after combining, before issuing from the nozzle as a spray. To secure good results the steam used at the burner should be as dry as possible, (this is very important) first selecting a location in steam system where as dry steam as possible can be had and this preferably from the boilers supplying the burners, with such branch connection to other source of steam supply as will enable the burners to be operated in raising steam on their own boilers when they happen to be cut out, covering the pipe leading to the burners, and even going so far as to introduce a superheating coil into a cooler portion of the furnace or the stack, putting in a by pass, so as to be able to cut this coil out, in case this became necessary or desirable.

The steam supply to the burners should be of greatly ample capacity, as increased volume in the pipe in proportion to radiating surface is a favorable feature and the pressure and temperature of steam are thus held higher.

The valves which control the supply of oil and steam to the burners should have rigid discs to avoid the vibration and consequent variations in supply which would be produced by loose discs. Burners in which the oil supply in automatically regulated or even partially so by variations in the steam pressure will be found to give the best results both as to ease of management and use of oil.

The most prominent mechanical characteristic common to nearly all oil burners is a central oil tube surrounded by a steam space between this tube and an outer shell. This would work the reverse as well if it was not for the difficulty of making an annular slit of sufficiently small diameter to discharge so fine a stream of oil, and the extreme liability of so small a slit stopping up.

The Insurance people have placed restrictions on the most desirable method of feeding oil to the burners, which is by gravity, from a stand pipe whose height and not diameter would be the controller of the pressure, an uniform oil pressure is a very important thing and no pump acting directly could produce so perfectly uniform pressure as could be had from an open top stand pipe which, although fed by a pump would not transmit the pulsations of the pumps to the burners.

The pumping system consists in pumping the oil into closed pipes attached to the burners, the pumps holding a fairly uniform pressure in the system of pipes by being controlled in speed by governors actuated by the pressure on the discharge side of pumps, a rise of pressure cutting down the speed and a fall of pressure accelerating same. In addition to this pumps are usually supplied with a relief valve set at a fixed maximum pressure whose office it is to discharge any surplus, should the regular governor fail to control the pressure of oil properly. This surplus should be conducted back to the supply tank and not to the suction pipe of the pump as any considerable circulation of the oil will form gases by the churning action of the pumps and this would cause a spasmodic ejection of oil and gas at the burners.

In regard to the safety of operating oil burners, notwithstanding numerous minor accidents have happened, there need be no fear on this score unless oil is allowed to escape into the furnace without being consumed as introduced or gas has been generated by the churning of the pump circulating the same oil several times through the pump. Where the relief valve discharges into the suction, a very great improvement in results is had by heating the oil before burning. For if oil passes through the burner cold, it becomes necessary for its temperature to rise over a great range almost instantly. To burn properly, a rise in the initial temperature to say 180° Fah. will be of great assistance. In order to secure the best results the oil should be heated at or very near the burners. An efficient heater for this purpose may be made as follows: Take a piece of four-inch pipe leading across the furnace (if not too long; if over eight or ten feet at most, make two heaters), cap one end, at the other end place a 4-inch by 4-inch by 1-inch T, the 1-inch side serving as a feed inlet. Put a close 4-inch nipple in other end of the T and on the end of this nipple place a 4-inch by 2-inch reducer, tapped from the inside for 2-inch pipe. Through this reducer from the inside, before putting it on, screw a piece of 2-inch pipe having a long thread. This pipe should be about 6 inches shorter than the 4-inch pipe, which when fitted up surrounds it. Cap the inside end of the 2-inch pipe. We thus have a 2-inch pipe for steam, inside of a 4-inch pipe, into which latter the oil is pumped. This pipe is tapped at suitable intervals with half-inch gas pipe to supply oil to the burners. Oil pipe holes for burners should be tapped on the top side in order to get the hottest oil. The 1-inch side of the feeding T should be turned downward so as to feed oil at the bottom. The long 2-inch thread projecting through the reducer, can have a 2-inch by 1-inch by ½-inch T placed at end, the 1-inch end serving as a steam inlet, and the ½-inch side of the T serving as the outlet or drain for the heater, which should have its condensation trapped away. The objection to having the inner pipe project through oil pipe at both ends is the difficulty of keeping joints

tight, because of unequal expansion of the two pipes. A heater of this class should be slightly depressed at the steam end to secure a fall for the condensation toward the outlet for the water. An 8-foot piece of such heater will be abundant for heating the oil for two 150 H. P. boilers. The heating of the oil is of sufficient importance to justify the most painstaking care to secure it. The heating systems offered attached to the pumps, while pleasing to the eye, by reason of their neat appearance, are a very expensive and a proportionately inefficient heater, for the reason that they are designed to heat the oil by the exhaust steam of the pump, and the fact is that the exhaust resulting from so light a duty is capable of accomplishing very little in the way of oil heating, and such heating as is effected, even if supplemented by live steam, is mostly lost in its circuit to the burners by flowing slowly through so much pipe.

In regard to the number of burners for a given horsepower, while many burners will do 150-horsepower, or over, it will be found to give more economic results as to fuel consumption, by using two or even three burners for such power, as a much better atomization of oil is secured by working each burner with a minimum quantity of oil.

While there are many pumps offered as especially adapted to the service, it is safe to say that any pump which is safe to use for any other liquid is safe to use for this service.

So far as furnace arrangements are concerned there is a great variety of details connected with the various installations. The following as applied to an ordinary return tubular boiler has given results which appeared to leave nothing to be desired. For a 60″ boiler place two burners usually in the center of the ordinary doors and half way from the boiler to the grates. Let the inner ends be flush with the inside of the front wall.

Cover all grate surface with ¼″ asbestos board, except the equivalent of about 64 square inches to each burner, and immediately under same. On top of this place a full layer of fire brick on the flat. Do not lay them too close, but allow a little for expansion. Plaster this over with fire clay. At a point about 36 inches from the point of the burner, lay a cascade wall one brick length in thickness. Set these on edge. Leave half-inch spaces. Run this wall up to within as near four inches of the boilers as the courses will make. Leave more rather than under four inches. Follow the circle of the boiler as nearly as convenient and set the brick up in a little fire clay to steady them. In case the bridge wall is as much as twelve inches from the boiler, lay one course on edge around this. Keep the pit behind the bridge wall empty. Stop all holes in the furnace walls and breeching. Put brick filling in the fire doors, leaving a loose brick near burner for lighting and observing the fire. Leave ash pit doors in place. Direct

the nozzles of the burners slightly downward so that they will strike the cascade wall about one-third of the way from the bottom.

The cascade wall serves very important purposes; first for storage of heat and then radiating it or giving it out and thus perfecting combustion which might not otherwise be complete, as any unconsumed gases could scarcely get through the small spaces in the highly heated bricks of the cascade wall without being burned.

As to the noise of oil burners, it is impossible for steam to escape into the open air without the characteristic hissing sound that is augmented or rather changed into a roaring sound caused by the slow vibrations of the air inclosed within the furnace walls. In degree it varies in different burners from a little less than a volcano to a great deal less, and is capable in all cases of being greatly reduced or rather confined within the furnace, and in some cases of being almost obliterated by careful attention to certain details of furnace arrangement, which consist mainly in receiving air at some other point than through the front of the furnace, usually through the ashpit and grate bars supplying air immediately under the burners. The entire obliteration of the noise is undesirable with all machinery and especially so with oil burners, as the legitimate noise of any machine is the most useful means an attendant has of reading its behavior.

I have been told by a close-observing sugar planter who is also his own engineer, and an efficient one at that, that his oil consumption for last season at full house capacity work was 32 bbls. to 280 tons of cane, or 1344 gals., equal to 4.8 gals. per ton of cane, or at 60 cents per barrel or 1.42 cents per gallon, equal to 6.8 cents per ton of cane. This was in a well-managed double effect house with good bagasse burners. A half gallon of oil per horsepower, per hour, may be taken as a safe basis for calculation. This is for the horsepower of boilers used for coal. A gallon of oil recently carefully weighed showed a weight of 7.152 ounces.

At the general session of the Railroad Commission held recently at Baton Rouge, the following tariff of rates on fuel oil transportation in Louisiana was adopted: Fuel oil in tank cars, 40 miles and less, 6 cents per 100; 60 miles and over 40 miles, 7 cents per 100; 80 miles and over 60 miles, 7½ cents per 100; 100 miles and over 80 miles, 8 cents per 100; 125 miles and over 100 miles, 8½ cents per 100; 150 miles and over 125 miles, 9 cents per 100; 175 miles and over 150 miles, 9½ cents per 100; 200 miles and over 175 miles, 10 cents per 100; 225 miles and over 200 miles, 10½ cents per 100; over 225 miles, 12 cents per 100.—N. O. Sugar Planter.

———:o:———

There are now in Great Britain 931 municipalities owning water works, 99 owning the street railroads (or "tramways,"

as they are called there), 240 owning the gas works, and 181 supplying electricity. Municipalities were not allowed to work the tramways until 1896. It is estimated that half of the gas users in England use municipal gas. In a number of places—Liverpool among them—the municipalities supply electricity for lighting and power, while the gas supply is still in the hands of private corporations. In the case of Liverpool, the gas company is quite willing to sell to the municipality, but the latter will not buy; first, because under the charter of the gas company the municipality would be compelled to pay a perpetual dividend of 10 per cent to the stockholders, and, second, because it is believed that in the near future electricity will practically supercede gas as an illuminant.

———:o:———

ROOT DISEASE OF SUGAR CANE.

Canes attacked by the common root disease of the sugar cane in the West Indies are familiar to the planters. Such diseased stools are distinguished by the fact that instead of forming cane the shoots continually bud from below giving rise to a dense tuft of dwarfed canes. Such canes on examination are seen to be covered at the base with a white, musty smelling, fungus growth which causes the lower leaves to adhere firmly to the stem of the cane. This fungus growth belongs to a common toadstool—a species of Marasmius—which may be seen in large numbers on the base of the shoots in wet weather. The fungus attacks the cane in Java as well as in the West Indies.

In consequence of the economic importance of this root-disease attempts have been made to find a direct remedy for this disease, that is to say, to find some means of arresting the disease when it has once shown itself. An experiment was made on October 17, 1901, in which four plots of 100 holes each of first crop canes attacked by the disease were treated as follows:

(1.) Canes stripped, sprayed at the base with Bordeaux mixture and then moulded up.

(2.) Canes stripped, sprayed at the base with Bordeaux mixture, limed at the rate of one quart of air-slacked lime per stool and then moulded up.

(3.) Canes stripped, limed as in (2) and then moulded up.

(4.) Control plot—untreated. This was a better plot than any of the above.

The canes were cut and weighed on February 27, 1902, and the following results were obtained:

Plot.	Wt. of Sound Canes.	Wt. of Rotten Canes.	Total.
(1)	1092	72	1164
(2)	1106	20	1126
(3)	1411	34	1445
(4) (Control)	2132	65	2197

The result shows that the treatment is not likely to be of any practicable use. The figures are of interest however, as showing that in the whole plot of one-third of an acre the tonnage of canes was at the rate of only eight tons per acre. The importance of the disease is evident. The indirect methods applicable to the disease are based on the idea of starving the fungus by depriving it of suitable food. Fields attacked by the disease should be first of all isolated by a trench from the rest of the estate so as to prevent the fungus spreading under ground. After reaping, the stumps should be dug up and burnt along with the trash remaining on the field. After thoroughly plowing up the field, some rotation crop should be planted after which the field could be again placed under canes.

In connection with these indirect methods of dealing with the disease an examination of sweet potatoes from a cane field attacked by the root-disease of the sugar-cane is of interest. It was noted by one of the planters that where a hole of sweet potatoes occurred near an old cane stump, the potatoes became covered with a white fungus growth. Examination of these specimens showed that the fungus on the potatoes is probably the same as that which attacks the cane. Evidently, therefore, when a diseased field is thrown out of cane cultivation the old stumps should be carefully dug up and burnt before the planting of any rotation crop.—Barbadoes Ag. News.

———:o:———

MOTH BORER IN SUGAR CANE.

Throughout the West Indian islands the sugar cane crop is now being reaped and the young canes have attained a certain height. This is the best season for fighting the moth borer by cutting out deadhearts and collecting the eggs. The work now done, in this way, will produce the greatest result for the least expenditure of time and effort. In Barbadoes there appears to be no lack of moth borer this season and it is to be hoped another year will not be allowed to go by without a more determined effort being made in all sugar growing Colonies in the West Indies to combat this pest wherever present. The insect and the remedies recommended for it have been fully discussed and full information may be found in the West Indian Bulletin. (Vol. I. pp. 338-345 and Vol. II. pp. 41-43.)

Egg collecting is the simplest and cheapest remedy and careful work in this direction would prevent the later occurrence of deadhearts, since it destroys the pest before it can do harm. In a dry season such as the present, planters hesitate to cut out many shoots in the young canes but there need be no hesitation in cutting off the eggs on the leaves. Having got the eggs they should be spread out in the sun near the

young canes so that the parasites (those friends of the sugar planter) may escape and find their way back to the canes. At this time of the year there are few parasites in the eggs. In a batch of five hundred egg clusters recently collected on an estate in Barbadoes, only one per cent. showed parasite attacks; but as the season advances and the parasites have less difficulty in finding an abundance of eggs on the young canes, this proportion will grow much larger.

The planter can do much to encourage the increase of the parasites, so that by the time the canes are getting too tall to be searched for eggs the parasites become numerous enough to do very effective work in checking such moth borers as may still be found in the canes. The time for this work is necessarily short but the opportunity should not be allowed to pass this year.

———:o:———

STORAGE OF FUEL OIL.

Now that the importation of crude petroleum is being made, and likely to increase, the question of where and how to store it, where it will be safe and still available for the regular supply of such factories as use it, will be an important one, not alone for the use of the mill or boiling house on plantations, but on the city front, or such localities as may be assigned for this purpose. The New Orleans Democrat contains an article on this subject, written by a gentleman, a chemist by profession, whose suggestions are well worth consideration:

"Since the development of the Texas oil fields a great number of industrial establishments have adopted petroleum for their steam boilers, and the demand for that kind of fuel is constantly increasing. Its advantages over coal consists in its economy, its convenience and its greater efficiency, weight for weight, as compared with coal.

"This advantage is to a certain extent offset by the cost of storing oil, whereas coal can be dumped anwyhere without serious loss or deterioration.

"Reservoirs or tanks of suitable dimensions are employed, some of them having the enormous capacity of 50,000 barrels.

"These vast accumulations of inflammable material will develop fearful energy when ignited, as the conflagration now raging at the Jennings oil well so fearfully demonstrates.

"Whether petroleum possesses the property of attracting lightning or not has not been definitely ascertained, but it is a well known fact that petroleum tanks have frequently been struck by lightning and their contents destroyed by fire.

"A covered tank completely filled with fuel oil will not be ignited by a flash of lightning; its metallic covering would receive the current and by reason of its great surface and volume it would diffuse the current and render it harmless.

"The volatile ingredients of crude petroleum from their ten-

dency to assume the gaseous form when the oil is confined in reservoirs partly filled constitute a serious source of danger and this tendency increases in direct ratio to the degree of temperature prevailing.

"When a certain proportion of petroleum vapor is in combination with air it forms an explosive mixture. Familiar instances of this phenomenon might be given in the gas and naptha engine, also in a partly emptied barrel of alcohol or whiskey, or a can with a little benzine in it—the latter will explode when a light is applied to the bunghole or spout.

"When the container is completely filled there can be no explosion. The liquids would burn quietly at the opening only. When petroleum is drawn from a covered oil tank air comes in to take its place, and herein lies the danger. Let us imagine, for instance, the case of a tank of great capacity, say 50,000 barrels, being half filled with fuel oil, and exposed to a prolonged spell of hot weather. Eventually enough of the volatile portion of the oil would be liberated to produce an explosive mixture with the contained air. The explosion of so large a volume of combustible gases would be attended with appalling and destructive energy, followed by great loss of life and property.

"Such a contingency can be avoided by supplying the space caused by the withdrawal of the covered tank by water instead of air as has hitherto been the rule. This can be done at little cost, for the supply of water is universally distributed, and it costs little or nothing. A small pump automatically regulated or the water from the hydrant would serve to keep the tank constantly and completely filled. The oil used would, of course, be drawn through a pipe from the top of the tank. When all the oil in the tank is withdrawn the water which replaced it can be run off and no trace of petroleum vapor will remain in the tank.

"Similar methods could be applied to the handling of oil cargoes on seagoing vessels with manifest advantage.

"Such a measure of safety should commend itself to everyone directly interested and to the public. Would it not come within the province of the city government to pass an ordinance compelling the owners of oil tanks within the city limits to use some such means as the above described for the protection of the lives and property of citizens?

"The conflagration now raging at one of the Jennings oil wells may be quoted as an evidence of the static energy of burning petroleum. Its dynamic force when ignited in the gaseous form in such volumes as the great reservoirs contain would dwarf the Jennings' blaze into insignificance.

"Trusting that the danger which threatens from the source above mentioned may be averted by conservative means."

—Su. Pl. Jour. ALEX K. FINLAY.

CULTIVATION OF PINEAPPLES.

By W. Cradwick, Travelling Instructor.

Soil.—The best soil for pineapples is a rich well-drained loam, they cannot be grown profitably on any other. The color of the soil does not matter, but there must be at least fifteen inches of good sweet top soil on the land in which the pines are to be grown.

Drainage.—The top soil must be thoroughly plowed and broken up. If below this, the soil is the least bit heavy, trenches to the depth of two feet must be dug to thoroughly drain it. If the lower layers of soil are clay, trenches three feet deep must be dug. If the level is so low that water lies at or near the surface, raised beds three feet high should be made on which to plant the suckers. This plan has been very successful near Hope Bay. Pineapples must have the best drainage possible or they will get all sorts of "disease."

Preparation of Soil.—Next to drainage in importance is the thorough forking and breaking up of the soil. There is an old Creole proverb that a pineapple sucker "planted with one chop bears in one year, with two chops in two years, and so on." The origin of it in my opinion is that when planting in new rich soft land, when a hole big enough to receive the sucker was easily made with one chop of hoe or digger, the pine sucker invariably produced a fruit within the year. When planting in old hard land where it was necessary to make two or three chops in order to make a hole big enough to receive the sucker, the sucker for want of cultivation or soil naturally soft, took two years to fruit. This explains how necessary it is to cultivate the land thoroughly.

Selection of Suckers.—Plant nothing but good, strong, fresh, stout *young* suckers; the proper size is from twelve to fifteen inches. Anything bigger or smaller is a mistake. Thin weedy shade-grown suckers are dear at a gift. Overgrown plants are not suckers, and should only be used to grow suckers from. In purchasing suckers, see that they are pointed just as they are torn away from the parent plant; for old long suckers can readily be trimmed down to look as short as young suckers.

Planting Suckers.—As soon as the sucker is taken off the old plant, it should be planted. If it is a fresh healthy one, it wants nothing at all done to it. If it is not a good healthy one, burn it. If you plant a poor sucker it will be a trouble all the days of its life. Never let suckers lie about in heaps; never let them get wet.

Have your land properly prepared and when the suckers are taken off, plant them as quickly as possible. The land should be so soft that the suckers can be pushed down to the proper depth without having to use anything to make a hole with.

Plant the suckers in beds not wider than can be weeded from the sides without having to step on them. Pineapples must have soft soil. and if the beds are walked on every time they are weeded, they soon get hard and stop the roots growing.

CULTIVATION.—Never allow the weeds to grow. Stir the soil often, using a dutch or push hoe, this is much better than the draw hoe which is very liable to bruise and shake the suckers when trying to dig out weeds which grow close to them.

DISTANCE.—Different varieties can be planted at different distances: the Ripleys and Bullheads eighteen inches; Smooth Cayennes two feet to two feet six inches.

REPLANTING.—Replant every year, never trust to ratoons. It is only by replanting every year that the quality of the fruit can be kept up, and the fruit made to come in at the right time. Ratoons will nearly all come in at the time of year when pines are not wanted. Pineapples are worth very little after the May rains begin, and everybody should make experiments in planting so as to find out the right time to plant to make their fruit come in at the right time, that is from Christmas up to May. The time will be different in different places.—Jamaica Bull.

———:o:———

No better illustration can be shown of the splendid improvement of the agricultural resources of a tropical country than that of Mexico. It is a valuable object lesson to our people of Porto Rico. What would appear to be the prime causes of this phenomenal agricultural success are the guarantees of assured progress and stability by Mexico. The industrial activity of this country has awakened enthusiasm among the Nations. Imbued confidence has been shown by the citizens of this Republic to embark in new enterprises and in every way to assist in maying paying operations of the investment of capital by outside parties. Cotton plantations of wonderful fertility are to be found near Torreon, Mexico, in the growth of which some of the most prominent financiers and business men of the United States are interested. Manufacturing concerns have been established, involving the expenditure of millions of dollars. Now that an era of unrestricted business activity has been opened up to Porto Rico, and with the strong moral support and financial backing of the United States—the greatest Commercial Nation of modern times—no stone should be left unturned on the island to welcome the capitalist and settler to our shores, and to extend to all the hand of fellowship. Let us pull together, and do for Porto Rico what our neighbor Mexico has accomplished by benevolent assimilation.—Ex.

———:o:———

And now it is reported that a successful cotton-picking machine has been perfected. If true, it means that the labor and consequently the expense of making a crop of cotton will be greatly decreased. It remains to be seen whether the price of

cotton will continue to rule as high as in the past and thus put the additional profit into the grower's bank account, or whether, as is usually the case, the price of cotton will go down in proportion to the saving made, thus benefitting the consumer only. Much depends upon the cotton growers themselves.

The statement in our July number (p. 307) regarding the yield of sugar per acre on the Ewa plantation, contained an important error. Instead of 12.2 tons per acre, it should have read: "The amount of sugar per acre was 15.02 tons per acre. The average polarization was 97.02."

CANE CUTTING MACHINES.—It is very satisfactory to note that an ever-increasing number of people are trying to solve the question of cutting cane by machinery and one can hardly read his papers for a week without coming across some mention, crude enough it is true, of a new effort to solve this great difficulty. More especially do we feel gratified to note that the idea of a reaping machine is gradually losing ground, and that there is an increasing number of believers in the adaptation of the sheep shearing principle to the cutting of cane. This probably results from the increased knowledge of cane growing conditions which would-be inventors are acquiring. If a machine is to be tested at cutting cane, it must do so in the field, where there is a fairly heavy crop, grown and cultivated under ordinary conditions. That the solution is possible we are perfectly satisfied. So long as too much it not attempted at one time a cane cutting machine or tool is quite feasible. That it will be greatly valued goes without saying. We have wanted it and begged for it for years, and the cane sugar industry all over the world is handicapped, as against beet sugar, by the want of a cheap method to harvest the raw material.—Ex.

———:o:———

CANE LOADER TRIAL.

Cane loading trials were to be conducted at the Sugar Experiment Station recently. Unfortunately, owing to a mishap to the engine on the Wright cane loader, that machine was not exhibited, thereby causing much disappointment. The Howard cane loader, however, was on hand and gave interesting demonstrations of its ability to do the work it is calculated to perform.

T. J. Howard, of St. Gabriel, La., was on hand and operated his machine so deftly as to leave little doubt that it can do what he claims, that is, load 200 tons cane in 10 hours. The maximum load lifter, sorghum being experimented on, was 638 pounds, and was picked up from the ground where it was placed across the rows when cut, and placed in the cart in 1½ minutes of actual time. That load was picked up with one

fork; as much as 800 pounds has previously been lifted with one fork. The body of the machine is six feet wide and is mounted on four iron wheels with axles six feet in width. From the body of the loader are four extending beams, each reaching 10 feet from the center of the loader, two to the front and two to the rear on either side of the body of the machine. The front beam on each side has resting on it an upright stand, from which extends a boom twelve feet long; these booms may be let out to fifteen feet. At the end of the booms, which swing about as desired, are racks or forks, in which the cane is drawn and held till dumped in carts. When a load is about to be lifted, four hanging legs are set beneath the beams to support them.

The machine straddles the row from where cane has been cut, the cane being cut and laid as ordinarily. Before the cane is cut a rope about seventy-five feet long is laid between the rows over which the cane is laid. As the loader advances to do its work, a short chain is fastened to the end of rope and drawn under and around the quantity of cane desired to be lifted. Then the chain is fastened to the lug or arm of boom, which draws the cane in rack or fork, hooking it there. Two mules work to the rear of the loader and draw on separate ropes which lift up the booms to the desired height, when they are swung around over wagon and load tripped therein.

A feature of the loader worthy of attention is that when the loader has to pass through a gate, or close to standing cane, the arms, or beams, extending to side, may be folded so that the entire width of machine is but six feet. Again, when starting down the row, to pick up cane, the cross bar of the wagon tongue may be fastened so that it will not allow of the loader being drawn in other than a perfectly straight line, thus obviating any wobbling in the rows. The appliance is made almost entirely of iron weighing about 2,000 pounds, and may be operated by two men and three boys, the boys going in front and passing chains around cane and to the two men, who each hook and trip the load at two racks; the third boy drives the mules that hoist up the loads.

There were probably about 100 visiting planters who attended the test, many of whom expressed themselves in no limited terms of praise for the Howard loader. After the test, Dr. Stubbs escorted the party about the Station and explained the various experiments being carried on there.—Sugar Planters' Journal.

———:o:———

CUTTING AND STRIPPING CANE BY MACHINERY.

At the next meeting of the Louisiana Planters' Association, to be held on the second Thursday in October, 1902, the subject of "Cutting and Stripping Cane by Machinery" will be discussed and it is desired to secure for exhibition at this meeting

descriptions and drawings of devices for accomplishing this work from all over the world. I now write to ask if you will be good enough to announce this in your journal and extend in the name of this Association a cordial invitation to every one no matter where located who has been working on a device of this character, to send to us a description and if possible a drawing of it, same to be addressed to the undersigned and to reach us not later than Oct. 1st. If you will be good enough to oblige us in this respect it will be highly appreciated.

Yours truly,

REGINALD DYKERS,

Secretary Louisiana Sugar Planters' Association, New Orleans, La., U. S. A.

P. S.—You might also mention that there is a standing reward of $2,000 offered by our Association for a successful machine of this character.

———:o:———

FORESTS AND WATER-SUPPLY.

(An instance from history.)

Everybody has heard of the monks of La Trappe, or Trappists, an order whose vows include a life of silence coupled with eight hours' hard work daily. The monastery was founded in 1140 by Rotrou II., Count of Perche, after losing his wife and his brother William in the wreck of "La Blanche nef." The forests with which it was endowed were kept till the Revolution, when they were confiscated to the State. Under which of the "rights of man" this course was justified it boots not to enquire.

Whether the Trappists had been abusing their forests is not distinctly explained, but it appears that they had certainly been cutting the coppice portion (the greater part) too young, for at the Reformation of 1665 an edict went out against them. This no doubt emanated from the great Colbert, and ran thus: "The religious community, the abbot, prior and convent of Notre Dame de la Trappe, &c., are hereby forbidden to cut any of the woods attached to the said abbey before the age of fifteen years, seeing the poverty of the soil. They shall regulate their coupes into fifteen equal fellings, and they shall leave standing at each felling the number of standards required by law; they shall allow one-third of their forest area to grow as high forest on the best soil in proximity to the Abbey itself."

This was duly observed till 1700, when the Abbe de Rance died, after ruling the monastery wisely and well for thirty-seven years. After his death the Trappists thought they would launch out into great ironworks, and the forests had to pay for the disastrous experiment. An old book "The Life of Dom Pierre, the Dwarf, cleric and former sub-prior of the Abbey of la Trappe," 1715, states the matter with due appreciation:—

"Iron ores have ever been plenty about the Abbey of la Trappe, and many times had the holy father, the late Abbe, been supplicated that he would allow it to be dug out by private persons who desired to establish ironworks. The abbey might expect much profit and no expense. Never would Dom Bouthillier de Rance yield, for he foresaw beneath the promise of large profits the certain ruin of the revenues of his house, coupled with spiritual demoralization and the relaxation of all the orderly life which he had been at so much pains to institute.

"But hardly was this holy man laid to his rest than Dom Jacques de la Cour, the new Abbe, lent a willing ear to the proposals of certain monks whose vows of solitude, &c., weighed too heavy on their impetuous natures. He took up a contract to run the iron works of la Trappe for thirteen years, and agreed to pay 2,800 livres for every year. Their destruction ran loose in the forests. Nobody knows how wastefully the furnaces swallowed up wood that might have been simply sold to far better effect. The springs soon dried up and the ponds (they had always depended on a series of ponds for water-power) became unable to supply more than six weeks' water for the year. The fires had to go out. The cost of relighting them at intervals was prohibitive. Thus fell to the ground all the ambitious hopes of the new Abbe. La Trappe became desperately indebted, much of its property had to be sold, and the monks were often in absolute want of the necessaries of life." Dom Jacques de la Cour became naturally Don Jacques de la Sacque, and the ironworks, the monastery, and the forest were involved in a common ruin. So far as the forests are concerned, the State is now working them under a plan of 1894, in three series; a high forest under sixty years' provisional plan, and two coppices with standards.

Such is a story that was printed two hundred years ago, long before forest officers and their opponents began to seek for proofs of another disputed matter.—Tropical Ag.

———:o:———

Volcanic Dust.—It is evident from the numerous chemical analyses that have now been made of the volcanic dust that fell at Barbados, that it was of little or no manurial value. Professor Harrison in commenting on the figures published, adds: "these conclusively show that the volcanic dust was quite valueless as a manure—the value of the soluble constituents being about three cents." Owing to the copious rains that fell immediately after the dust, causing a sudden bursting of leaf and flower on plants that had previously been parched by drought, a popular idea has arisen that the dust was, more or less, of a fertilizing character. It is believed, probably on good grounds, that it was useful in destroying the small black ants common at Barbados, and in drying up the egg-clusters of the moth-borer then on the leaves of the sugar-cane.—Ex.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co.	$ 1,000,000	10,000	$ 1,000,000	$ 100	375
N. S. Sachs' Dry G'ds Co. L'd.	60,000	600	.....	100	100
L. B. Kerr & Co., Ltd.	200,000	4,000	.....	50	
SUGAR					
Ewa Plantation Company	5,000,000	250,000	5,000,000	20	17½
Hawaiian Agricultural Co.	1,000,000	10,000	1,000,000	100	270
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	33½
Hawaiian Sugar Company	2,000,000	100,000	2,000,000	20	20
Honomu Sugar Company	750,000	7,500	750,000	100	130
Honokaa Sugar Company	2,000,000	100,000	2,000,000	20	11
Haiku Sugar Company	500,000	5,000	500,000	100	100
Kahuku Plantation Company	500,000	25,000	500,000	20	23¼
Kihei Plant. Co. Ltd.,	2,500,000	50,000	2,500,000	50	10
Kipahulu Sugar Company	160,000	1,600	160,000	100	.....
Koloa Sugar Company	500,000	5,000	500,000	100	164
McBryde Sug. Co. Ltd.	3,500,000	175,000	3,500,000	20	3
Oahu Sugar Co	3,600,000	36,000	3,600,000	100	60
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	24½
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	8
Olaa Sugar Co. Ltd., Assess.	2,500,000	125,000	865,000	20	3¾
Olaa Sugar Co. Ltd., Paid up	2,500,000	125,000	2,500,000	20	7¾
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	12
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company	750,000	7,500	750,000	100	250
Pepeekeo Sugar Company	750,000	7,500	750,000	100	.....
Pioneer Mill Company	2,250,000	22,500	2,250,000	100	60
Waialua Agricultural Co.	4,500,000	45,000	4,500,000	100	35
Wailuku Sugar Company	700,000	7,000	700,000	100	300
Waimanalo Sugar Company	250,000	250,000	250,000	100	160
Waimea Mill Company	125,000	125,000	125,000	100	.....
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	100
Hawaiian Electric Company.	500,000	5,000	500,000	100	85
Honolulu R. T. & Land Co.	250,000	2,500	250,000	100	60
Mutual Telephone Company	150,000	13,900	139,000	10	10
Oahu Railway & Land Co.	4,000,000	40,000	4,000,000	100	85
BANKS					
First National Bank	500,000	5,000	500,000	100	.....
First Am. Sav. B. & Trust Co.	250,000	2,500	250,000	100	.....
BONDS	Amt. of Issue				
Hawaiian Govt. 5 per cent.	1,251,200	Dec. 31, 1900	.....	.....	97½
Hilo Railroad Co., 6 per cent	1,000,000	750,000	.....	.....	.....
Hono. R. T. & L. Co , 6 p. c.	300,000	.....	.....	.....	100
Ewa Plantation 6 per cent.	500,000	.....	.....	.....	101½
Oahu Railway & L'd Co. 6 p. c.	2,000,000	.....	.....	.....	104½
Oahu Plantation 6 per cent.	750,000	.....	.....	.....	100
Olaa Plantation 6 per cent.	1,250,000	.....	.....	.....	.....
Waialua Agr. 6 per cent.	1,000,000	.....	.....	.....	100

PLANTATION DIRECTORY.

Island and Name.		Manager.	Post Office
OAHU.			
EwaPlantation Co	*	G. F. Renton	Ewa
Waianae Co.	***	Fred Meyer	Waianae
Waialua Agricultural Co	*	W. W. Goodale	Waialua
Kahuku Plantation Co	x*	*Andrew Adams*	Kahuku
Waimanalo Sugar Co	**	G. C. Chalmers	Waimanalo
Oahu Sugar Co	x	Aug. Ahrens	Waipahu
Honolulu Plantation Co	**	J. A. Low	Aiea
Heeia Agricultural Co. Ltd	*x*	W. W. McGowan	Heeia
Laie Plantation	x*x	S. E. Wooley	Laie
MAUI.			
Olowalu Co	**	Geo. Gibb	Lahaina
Pioneer Mill Co	x	L. Barkhausen	Lahaina
Wailuku Sugar Co	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sugar Co	x*	H. P. Baldwin	Puunene
Paia Plantation	x*	D. C. Lindsay	Paia
Haiku Sugar Co	x*	H. A. Baldwin	Hamakuapoko
Hana Plantation	xx	K. S. Gjerdrum	Hana
Kipahulu Sugar Co	x	A. Gross	Kipahulu
Kihei Plantation Co	x*	James Scott	Kihei
Maui Sugar Co	x**	J. R. Myers	Huelo
HAWAII.			
Paauhau Sugar Plantation Co	**	Jas. Gibb	Hamakua
Hamakua Mill Co	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	J. M. Horner	Paauilo
Kukaiau Mill Co	*x	E. Madden	Paauilo
Ookala Sugar Co	**x	W. G. Walker	Ookala
Laupahoehoe Sugar Co	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	Geo. Ross	Hakalau
Honomu Sugar Co	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co	*x	H. Deacon	Pepeekeo
Onomea Sugar Co	**x	J. T. Moir	Papaikou
Hilo Sugar Co	**	J. A. Scott	Hilo
Hawaii Mill Co	x	W. von Graevemeyer	Hilo
Waiakea Mill Co	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co	**x	C. M. Walton	Pahala
Hutchinson Sugar Plantation Co	**	G. C. Hewitt	Naalehu
Union Mill Co	*x	Jas. Renton	Kohala
Kohala Sugar Co	*	E. E. Olding	Kohala
Pacific Sugar Mill	x**	D. Forbes	Kukuihaele
Honokaa Sugar Co	x**	Jno. Watt	Honokaa
Kona Sugar Co	xxx		Holualoa
Olaa Sugar Co	xx*	F. B. McStocker	Olaa
Puna Sugar Co	xx*	W. H. Campbell	Kapoho
Halawa Plantation	x*x	T. S Kay	Kohala
C. F. Hart, (Niulii)	*x	R. Hall	Kohala
Hawi Mill & Plantation	††	John Hind	Kohala
Puako	††		
KAUAI.			
Kilauea Sugar Plantation Co	**	A. Moore	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co	**x	G. H. Fairchild	Kealia
Grove Farm Plantation	x	G. N. Wilcox	Lihue
Lihue Plantation Co	x	F. Weber	Lihue
Koloa Sugar Co	x	P. McLane	Koloa
McBryde Sugar Co	*x	W. Stodart	Eleele
Hawaiian Sugar Co	x*	W. A. Baldwin	Makaweli
Waimea Sugar Mill Co	*	J. Fassoth	Waimea
Kekaha Sugar Co	x	H. B. Faye	Kekaha

Key	Honolulu Agents	
*	Castle & Cooke	(4)
**	W. G. Irwin & Co	(8)
***	J. M. Dowsett	(1)
x	H. Hackfeld & Co	(9)
xx	M. S. Grinbaum & Co	(2)
xxx	McChesney & Sons	(1)
*x	T. H. Davies & Co	(8)
**x	C. Brewer & Co	(7)
x*	Alexander & Baldwin	(5)
x**	F. A. Schæfer & Co.	(3)
xx*	B. F. Dillingham & Co	(2)
x*x	H. Waterhouse & Co	(3)
x	C. Bolte	(1)
††	Hind, Rolph & Co	(1)